Indian Horticulture

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hal (Annona squamosa)—*A delicious fruit rich in vitamin C and sugar*

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OUR COVER
A colourful display of mixed vegetables
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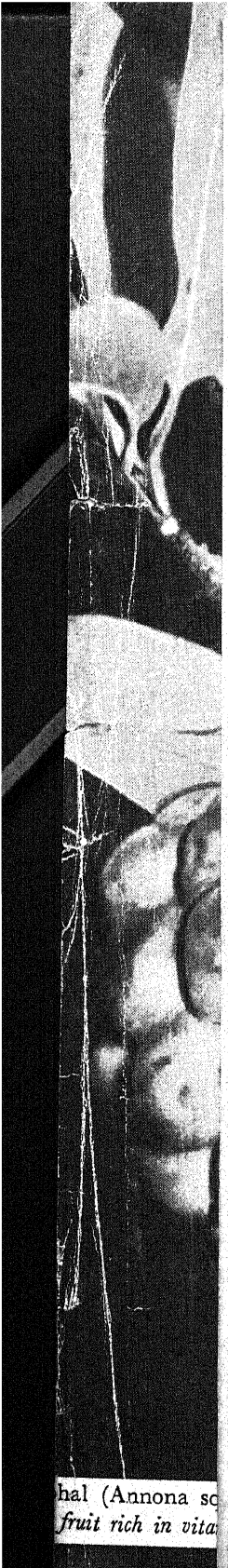


hal (Annona sq
fruit rich in vita

editor's page

NEED FOR A CENTRAL INSTITUTE

The importance of Horticulture as a major branch of Agriculture can hardly be gainsaid. What with the teeming population of our country and what with the sorry spectacle of millions of them subsisting on diet shockingly poor in nourishment and protective food substances, it is only proper, fruit and vegetable crops played their role to supplement the nutritional resources. Such an important science should not suffer the neglect of either the Government or men connected with its research. Horticulture offers immense scope for fundamental and applied research, and what is needed urgently is a provision for an adequate and competent organisational set-up to tackle all problems related to Horticulture.

A project for planned research for the improvement of fruit and vegetable crops by offering financial assistance to the states was no doubt initiated by the Indian Council of Agricultural Research as far back as 1929, but this project left the basic problems of Horticulture unsolved; the states attempted to tackle problems purely of local importance and of an applied nature. The good gesture shown by the Central Government in 1945 in deciding to carve out a Central Institute of Horticultural Research aborted consequent on the partition of the country which brought in its wake a host of difficulties. The efforts recently made to establish Regional Fruit Research Stations did not come anywhere near the ideal of an All India Institute. What is of prime necessity to-day is an organisation able to tackle the crucial and nation-wide subjects of inter-state interests, and not any set-up with a local complexion circumscribed by a limited outlook. Even the Division of Horticulture at the Indian Agricultural Research Institute, in spite of its superiority over regional stations by way of equipment and staff, cannot make all round progress, as it is stationed far away from the major areas under fruits and vegetables. A Central Institute of Horticultural Research, flanked with Regional Research Centres for fruits and vegetables seems unmistakably the need of the hour, the solution to the formidable problems facing us.

The Central Institute should, along with the Regional Centres, work on field problems of nation-wide or regional importance eliminating the state barriers in its approach. The purely local problems may be taken care of by the Horticultural Stations and the short-term schemes now in operation in various states. The Central Institute should act as the nerve centre and resolve the diverse problems of all the important belts known for commercial production of fruits and vegetables. All non-essentials and spurious items should be cut off from the project in locating the centre, recruiting the research staff, and planning the laboratories. Every step whether in the laboratory or in the field should be aimed in the direction of achieving practical results and helping the growers effectively in fulfilling the targets set before them. The states help in the establishment of such a Central Institute by providing land wherever the centres are to be started.

The fruit of Horticulture is thrice blessed. It yields much more food per unit area; it gives larger profits to the growers; and it improves the health of the nation. To neglect it, to say the least, is to neglect one's own primary duty to the country.

KNOW TO PACK YOUR NURSERY PLANTS

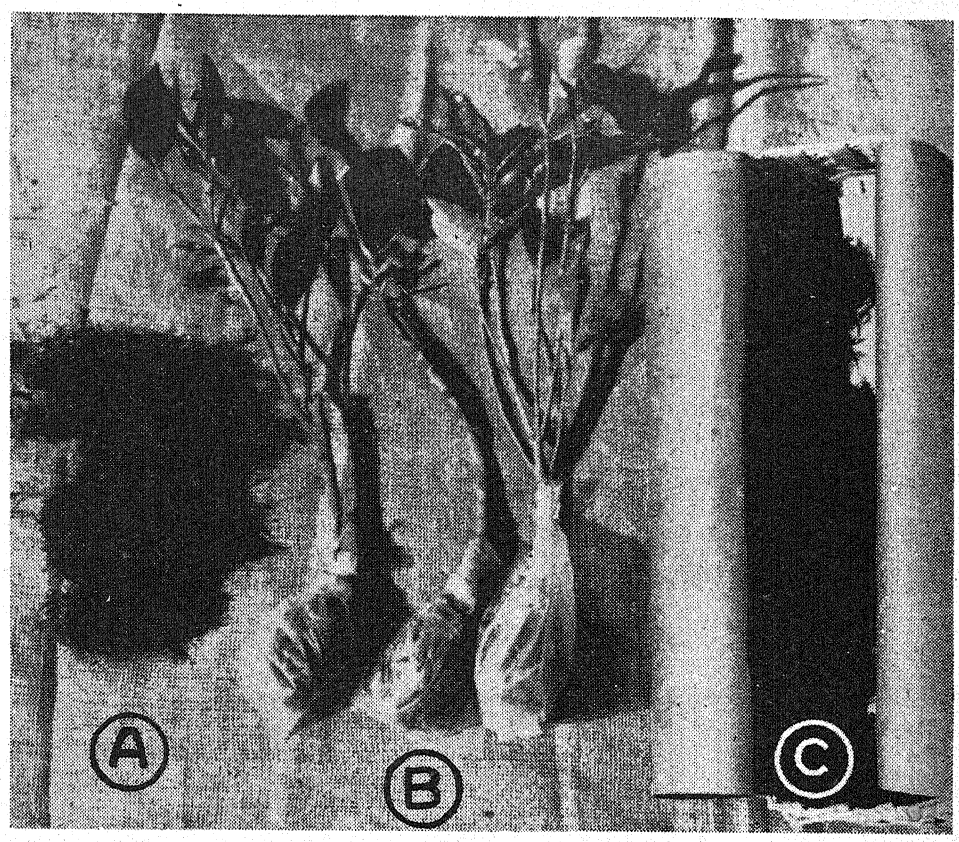
BHANU L. DESAI

THE PACKING methods practised by the nurseries for transport of nursery plants to distant places in India are neither uniform nor efficient. In different parts of the country, various practices are followed which are claimed to have been evolved by long experience of the local nurserymen. The packing methods often vary according to the nature of the plant, the season and the cheapest packing material available at the time of packing the plants for despatch.

NEGLIGENT PRACTICES

For instance, in many parts of the country, forest nurserymen uproot the plants from their beds and tie them in large bundles, with or without soil, in old hessian bags, keeping the plant tops exposed to air, and their roots tightly packed or tied in the hessian cloth. Their argument is that the forest plants are very hardy by nature and excessive transpiration during transit is not so detrimental as to injure the plants. Besides, the forest plants are grown in the nursery in such an abundant quantity at very little cost that a few casualties would not matter much.

In many parts of Maharashtra and elsewhere the packing of citrus plants, either grown from seeds or prepared by budding, follows a similar pattern. The practice of packing pomegranate, fig and guava plants grown from seeds does not differ from the above. The pomegranate and the guava propagated by "gootee" or air-layering, and side-grafting respectively, are packed with some soil attached to the roots, if they are not already potted in small earthen *matkis* or pots.



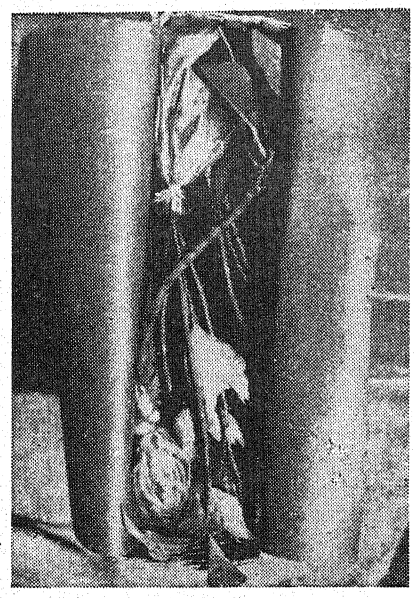
(A) The moss, (B) Plants enclosed in polyethylene bags, and (C) The bamboo basket with waterproof paper lining and moss 'cushion'

In many places the nurserymen pack the roots of newly lifted plants in a ball of sticky clay, wherever it is available locally. The ball of earth is then covered with grass and tied as firmly as possible, thus securing the roots against drying. A number of plants thus prepared are filled closely in light, loosely-knit bamboo or "rattan" baskets. The baskets are covered thinly with date palm leaves as protection against injury during railway transhipment.

'Prepared' plants placed close together inside a basket

In the case of mango grafts in pots, the plants are packed in light baskets along with the pots or *matki*. A light wooden box with a handle in the centre is used by some nurserymen for roses destined for long distant stations. Often the box is covered with a thin muslin or hessian cloth. In this case as well, the roots of the rose plants are packed with a ball of sticky clay, and covered with a layer of grass. Often nurserymen send their plants with the original small pots in which they were propagated earlier. The plants with the pots are packed in light baskets with some cushion of grass to reduce the impact while loading and unloading the parcels on their long journey by road and rail.

Plants neatly packed in the basket are ready for despatch



Packed plants ready for despatch by air

Some nurserymen do not take the trouble to use bamboo baskets. They use large baskets woven out of date palm leaves with limp walls or sides. Plants such as coconuts, chikoo (sapota), guava, mango, croton, and a host of other species are packed as tightly as possible in these date palm leaves baskets, and made into a bundle tied firmly with ropes and shipped by rail or truck. This packing is done irrespective of the plant containers, which may be pots or a ball of earth with or without the grass covering.

Generally the methods adopted all over the country, for packing the plant material for despatch by rail are similar to those mentioned above, with some variations and exceptions. The plants packed in this fashion are invariably damaged, and some of them do not survive the careful treatment given during or after transplanting them in their permanent places.

For successful lifting from the nursery, packing and despatching of plants, the essential requirements are not many. The roots of the grown-up plants should not sustain heavy or irrepairable injury while removing them from the bed or from the pot. During transit the loss of water by transpiration should be the minimum. While plants are awaiting despatch or delivery at the railway platforms, precaution should be taken against pilferage or damage by animals.

By experience the following practice of packing plants has been found very efficient.

PACKING

It has been observed that if the plants are watered lightly, just to moisten the soil, before removing them from the bed or pot, they can be taken out easily, with very little injury to the roots. A small ball of earth, about three to four inches in diameter, is retained around the

Flowers are the sweetest things that God ever made and forgot to put soil in it.

—H.W. Beecher

roots, trimming those which are excessively long. The plant is placed on a small piece of old hessian cloth about one to one and a half feet square. The four ends of this cloth are brought over the ball of earth containing the roots and tied fairly tight with a string or 'sutli'. Thus the moist ball of earth is secured round the roots, and there is no chance of its breaking loose during the journey.

In the case of mango grafts where it is desirable to retain the pot or 'matki', the hessian cloth is wrapped around the container and tied firmly. During transit the pot or "matki" is usually broken, but the hessian cloth keeps the broken shreds in place and the soil and plant roots remain undisturbed until the planting time.

A round, strongly woven bamboo basket is selected which is reinforced with iron or strong bamboo strips at the base. Some grass, sawdust, rice husk, or any other light material such as paper shavings or leaves, is spread inside the basket to act as a cushion. The prepared plants are soaked in water at the roots and packed as tightly as feasible in the basket. The tops are tied lightly to prevent their stems from shaking, sagging or rubbing together. Three strong bamboo sticks about two and a half feet long are inserted firmly into the woven material of the basket and tied at the top. These form the frame-work for the small hessian cloth tent which covers half of the basket and most of the plants. The hessian cloth cover is sewn up with the basket and along the joint. The address label for the parcel is written in pencil and again covered with a polyethylene bag to preserve it against water and weather.

ASSURED SAFETY

This method sounds tedious and comparatively expensive than the other packing practices prevailing at present. But the survival and safety of the plants is assured 100 per cent by adopting this method. Some nurserymen recommend polyethylene bags or wrappers to pack the ball of soil at the roots. This perhaps involves less labour and keeps the packing cost down, but it has been noticed that, invariably, many of the bags are torn, and the ball of earth gets loose from the plant roots, thus causing often irrepairable damage. Perhaps a thicker gauge of polyethylene cover, well tied with string or 'sutli', over the ball of earth, might help.

To pack the plants for air transport, a slightly different technique is used. For air freight the size and the weight of the package is limited. The heavy air freight charges per pound are also taken into consideration. The plants selected are not more than two feet in overall length, including the roots. If there are many branches or leaves they are trimmed and defoliated, without causing plant injury. The soil is washed off the roots of the plant by shaking its lower part in a bucket full of water. If some soil particles remain sticking to the roots, they are allowed to remain and not rubbed off. Some hormone powder is sprinkled on the roots and damp moss is tied in a ball to the roots. This is encased in a polyethylene bag.

A light, thinly woven rectangular bamboo basket or a hard cardboard box is selected to pack the plants. Some moss, which has been earlier moistened, and squeezed out thoroughly to make it just damp, is spread over the lining of the waterproof paper in the basket. The plants are laid in the basket over this cushioning of moss and fixed firmly with the string or pieces of thin bamboo sticks to the sides of the basket. This prevents shaking of the plants during transhipment. The basket is closed and a piece of cheese cloth or thin hessian cloth is sewn on it. The address on the airfreight basket is printed on the cloth or the label bearing the address is firmly sewn on it.

By the above method the plants have been flown to the U.K. and the U.S.A. most successfully without a single casualty or the slightest damage to them.

While re-planting the plants received by rail, it is recommended that the plants be planted without removing the hessian cloth or disturbing the ball of earth. It is suggested that the moss is removed and the roots are soaked in water for a few minutes before transplanting those plants which arrive with moss at their roots.

The packing method practised for airfreight parcels is often followed for rail parcels. In this case a strong wooden case is used to the prepared plants. Often the wooden case is substituted by a round bamboo basket. Here the plants are arranged upright in the packing case and later covered with hessian cloth. The basket can hold more than 50 plants as against the 10 or 15 plants packed with the ball of earth. Usually the plants shed their leaves during a long journey when their roots are packed in moss. But they sprout again after repotting or transplanting them at the destination.

The packing methods described above may be changed to suit individual plant requirements, while adhering to the basic principle enunciated here.

INFLATION

Lady: *"How much are those oranges?"*

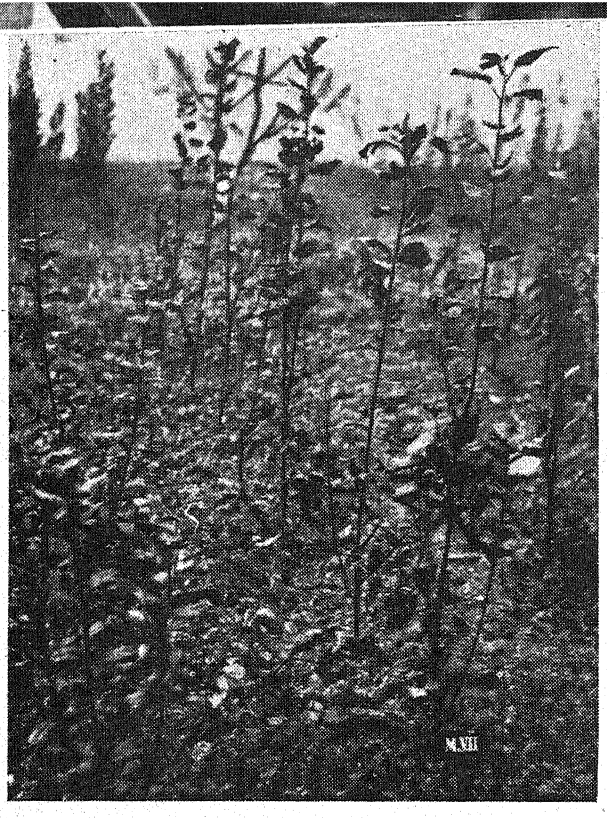
Grocer: *"Four rupees a dozen, madam."*

Lady: *"Did you raise them yourself?"*

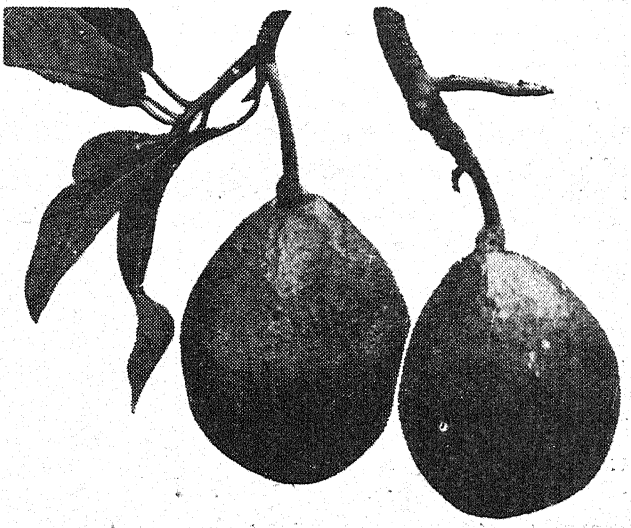
Grocer: *"Yes madam, they were two rupees a dozen yesterday."*

ICAR HAS A BIG ROLE IN FRUIT DEVELOPMENT

DALJIT SINGH
Agricultural Officer and Systematic Pomologist



Malling rootstocks introduced from England at Mashobra



Avocado fruit

THE PARTITION of the country in 1947 gave a serious set-back to horticulture, especially fruit development and research. Well-developed areas, particularly of citrus fruits, grapes, dates and stone-fruits, were almost entirely lost to Pakistan. Taking into consideration the agro-climatic requirements of different regions, the Central and the State Governments were called upon to work out the problems connected with fruit-growing in different States. The I.C.A.R. undertook the responsibility of expanding and rehabilitating the fruit industry by formulating schemes for development and research purposes. To achieve these objectives, several projects costing five crores of rupees were executed during the Second Plan which resulted in 2 lakh acres of new orchards and renovation of 1.9 lakh acres of bearing orchards. The tempo of development has been almost doubled during the Third Plan and a sum of nine crores of rupees have been earmarked for this purpose.

RESEARCH PROGRAMMES

In order to tackle short-term and long-term problems connected with fruit production, the Government of India launched during 1955-56, the first phase of its research intensification drive by establishing eight regional fruit stations supported by a number of sub-stations in different agro-climatic regions of the country.

The I.C.A.R., at its headquarters, sanctioned a research scheme in 1947 to describe and classify different kinds of fruits and their varieties with the object of straightening the confusion in their nomenclature. Under this scheme, work on mango has been completed and a monograph entitled "The Mango in India" has been published. The work on citrus is in hand. Another scheme, Horticultural Abstracting Service, was also started in 1947 with a view to keep abreast the horticultural research workers of the latest developments in the field of horticultural research. A scheme for All India Fruit Shows and Udyan Pandit competition was also launched in 1955.

Besides the main regional and sub-stations which were financed jointly by the I.C.A.R and the States, the following coordinated schemes of an *ad hoc* nature financed entirely by the Council were sanctioned: (*a*) Coordinated scheme for investigation into the

causes of citrus die-back; (*b*) Co-ordinated scheme to study the application of growth regulating substances in horticulture; (*c*) Improvement of the cultivation of date palm; and (*d*) Mango malformation. A nine lakh rupees scheme has been started for the establishment of a National Hortorium with three centres, *viz.*, Mashobra (H.P.) for temperate crops; Meerut (U.P.) for sub-tropical crops and Hesarghatta (Mysore) for tropical crops. Under a pilot I.C.A.R scheme on fruit crop estimation, surveys have been completed on mango in U.P., banana in Kerala and sweet orange in Maharashtra.

During the Third Plan, greater emphasis is being laid on increasing production of nut crops for export purposes. Schemes on walnuts have been sanctioned in the Kulu Valley (Pb.), Chakrata and the Jaunsar-Bawar area (U.P.) and in Himachal Pradesh.

RESULTS ACHIEVED

Needless to say, improvement of perennial crops like the fruit through research is a long-term project. It will take many years before the results of the newly started projects become available. However, a brief account of the results of practical significance so far achieved, crop-wise under the various Central and State research schemes in the post-independence period is given below.

MANGO

In the coastal region, 10 polyembryonic races have been located, of which Olur, Bappakai, Ambalavi and Vellai Columban have shown promise, particularly the latter two, as regular croppers under Poona conditions. In the Madras State, varieties Peter, Baneshan, Ambalavi and Neelum have been recorded as off-season bearers. At Kodur, a promising cross of mango called Swarna Jehangir has given much better performance than the commercial varieties of Jehangir and Swarnarekha used as parents. Promising selections reported from Kodur (Andhra Pradesh) are K.Os. 22,16,11,7 and 6. At Gandevi (Gujarat State), selection No. 49 has proved to be high yielding, combined with good quality.

Young date seedlings at the Research Station, Abohar

In West Bengal and the neighbouring areas, the cultivation of two mango varieties, *viz.*, Safdar Pasand and Himsagar should be popularised. The former is an early type and the latter is a mid-season variety.

The mango strains, Dusheri No. 106 and 110, have proved regular bearers at Sangareddy, Andhra Pradesh.

At Krishnagar, West Bengal, veneer grafting on seedling rootstocks has succeeded. Forkert budding by the modified method and top-working of adult trees have been standardised into nursery propagation practices.

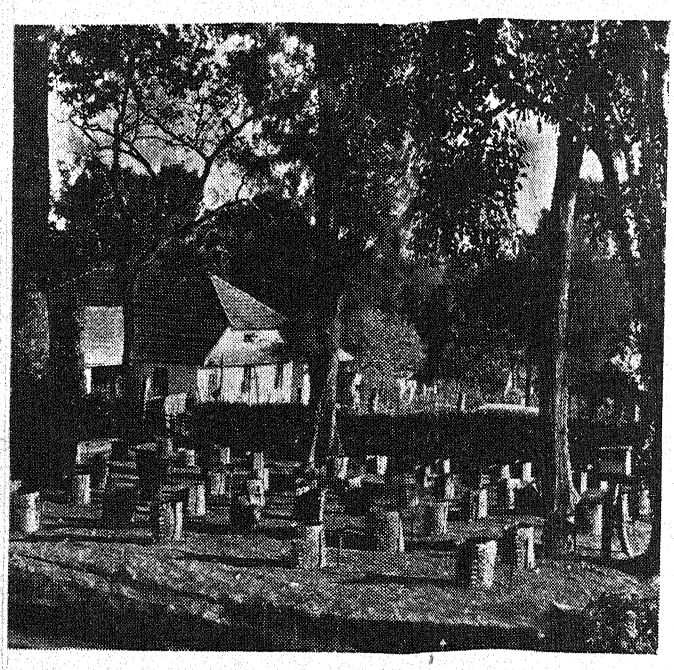
Scionic effects resulting from the use of mono and polyembryonic rootstocks and in double working with foster mothers characterised by differential attributes have engaged the workers at Sabour (Bihar), Malda (West Bengal), Periyakulam and Vengurla (South India), Saharanpur (U.P.) and Poona (Maharashtra). There is some evidence in Madras State that the intermediate stem-piece promoted regularity in the cropping behaviour of the scion.

Inter-cropping with vegetables and leguminous green manure crops has proved to be beneficial to the main orchard crop in trials at Kodur (A.P.) and Poona (Maharashtra).

Study on the problem of erratic cropping behaviour of the mango is being reorientated to focus attention on physiological aspects. At Sabour, Bihar, a cultural-cum-manurial schedule claimed to reclaim irregular bearers has been evolved. Other mango research centres in the country are testing this regimen under their own conditions of soils and climate. The relationship, if any, between the period and intensity of bearing of flushes and fruit bud differentiation, in Neelum in the south, Langra in the north and Alphonso in the west is being studied. It has been observed that flushes put forth after February generally failed to differentiate flower buds, whereas earlier October flushes were able to do so. Another finding is that erratic bearing is more pronounced in certain varieties like, for instance, Pairi. The use of growth regulators for correcting this defective feature has not given any promising indications.

Anthracnose disease in mango has been efficiently controlled by two sprayings of Bordeaux mixture (1 :1 :30) first in August and again in September.

In Bihar, a spray recipe of napthalene acetic acid at 10 p.p.m. has been found successful in reducing preharvest fruit drop in mango.



Citrus seedlings protected from the sun with bamboo cages

BANANA

The best time of planting Basrai banana in east Khandesh and Poona districts is February.

At Chinsura, *Kabuli*, *Champa* and *Martaman* have been selected as promising varieties. Giant Governor was found to combine tolerance to Panama disease with promising yields and superior fruit quality. At Aduthurai (Madras), 172 crosses are under study. Of these, hybrid Neypoovan × *M. balbisiana* is reported to show promise.

In desuckering experiments with variety Champa, at Chinsura, retention of more than two suckers has been observed to depress yields of the mother tree. At Poona, trials have shown that the practice of removing all the daughter suckers except the primary is benficial for giving higher and earlier yields. With the variety Basrai, four-month-old suckers have proved superior to younger suckers for use as planting material. Studies at the Banana Research Station, Aduthurai, with Monthan variety of banana had shown that cutting the pseudo-stem completely to the bottom after harvest of the bunch is less preferable to leaving the pseudo-stem untouched after the harvest. In another experiment it was found that whole corms as well as bits can be used for planting without detriment to yields.

At Chinsura, spacing of 9 x 9 feet for the tall types and 6×6 feet for the dwarf has proved optimum. At Poona, on the other hand, a spacing of 5 to 6 feet between plants for the dwarf and 8 to 10 feet for the tall varieties has proved best. At Tanuku, A.P., a spacing of 6×6 feet has been found superior to 8×8 feet for Karpura chakkerakeli. At Aduthurai, under perennial cultivation of Monthan and Rasthali varieties, 9 feet spacing either way, appeared to be suitable.

At Chinsura, application of eight ounces of nitrogen per clump has yielded the most profitable crop. Under the south and western Indian conditions (at Aduthurai and Poona), nitrogen at 0.4 lb. per stool, half of it applied in the organic form before planting and half top-dressed as fertiliser later has been found to be an economic practice.

In Kerala, banana aphid can be successfully controlled by one of several effective insecticides such as Ekatin, Endrin, Metasystox or Basudin.

CITRUS

The horticultural aspects of citrus crop improvement received adequate attention, barring the fact that citrus decline assumed serious proportions in certain areas.

A newly introduced variety of thornless lime has given good performance in Coorg and needs wider popularisation.

In Bihar, an addition of 2 lb. of P_2O_5 and 2 lb. of lime over and above the normally recommended doses is claimed to have altered the sugar/acid ratio from 9:1 to 16:1. At Tharsa (Nagpur), oil cakes as manure imparted greater vigour to mandarin trees than either farmyard or green manure. At Attari, Punjab, 3 lb. of N per tree applied equally in the form of ammonium sulphate plus F.Y.M. has proved most beneficial. This is in addition to a basal dose of a hundred pounds of farmyard manure per tree.

Cover crops of cowpea, sunnhemp and kalai (*P. mungo*) have shown promise in cultural trials conducted at Burnihat (Assam). *Senji*, as green manure in association with an application of N at the rate of one pound per tree improved both yield and quality of sweet limes at Attari (Punjab).

The mandarin orange trees in Wynad (Malabar) which were manured and mulched, were able to withstand drought conditions better than other trees receiving such treatments as (*a*) digging round plants twice a year, (*b*) mulching alone, (*c*) growing a cover crop, (*d*) digging twice and manuring and (*e*) cutting down weed growth.

Zinc deficiency in Mosambi and Sathgudi oranges and in mandarins has been effectively overcome by spraying with lime and zinc sulphate in the South.

In Assam, the rough lemon rootstock (Sohmyndong —*C. jambhiri*) has proved to be comparatively the best for the Khasi mandarin (*C. reticulata*). At Angul, Orissa, Kandhia local or Karuna (Kichili—*C maderaspatana*) has been found incompatible wth the Nagpur Santra (*C. reticulata*) whereas Kharna Khatta (*C. karna*), followed closely by the sweet lime (*C. limettioides*) and Jambhiri (*C. jambhiri*) have shown their suitability. At Kodur,

Andhra Pradesh, precocious bearing of Sathgudi trees (*C. sinensis*) has been associated with the employment of wood apple (*Limonia acidissima*) and Gajanimma (*C. pennivesiculata*) rootstocks but the latter is highly susceptible to gummosis. The Sathgudi scion registered better growth on its own seedlings than on Kitchili and acid lime. At the same place, budded trees of acid lime (*C. aurantifolia*) have come to bearing earlier than seedling trees. They are also resistant to dieback and wither tip diseases. At Poona (Maharashtra State), Mosambi scions (*C. sinensis*) have grown better, yielded more and produced better quality fruits on Rangpur lime (*C. limonia*) and rough lemon (*C. jambhiri*) stocks. At Tharsa, the combination Nagpur Santra (*C. reticulata*)/Rangpur lime (*C. limonia*) has come out as the best for yield and scionic compatibility. At Chethalli (Coorg) the Coorg, orange (*C. reticulata*) on Belladakithuli (*C. reticulata*) and Baduvapulli (*C. pennivesiculata*) has grown vigorously. The incidence of chlorosis was more on sour orange stock and of mottling on pummelo and grapefruit rootstocks.

Effective control of pre-harvest drop in sweet oranges has been obtained by spraying the trees with 2,4-D and 2,4,5-T at 5 to 10 parts per million. D.D.T. spray at 0.16 per cent coinciding with the time of incidence of fruit sucking moths has been effective in reducing damage of sweet oranges by the pest in the Maharashtra State. At Kodur, Andhra Pradesh, *neem* oil emulsion or *neem* cake extract has been useful in checking the citrus leaf miner. On the other hand, at Nagpur, nicotine sulphate and fish-oil rosin soap have been beneficial for the control of this malady.

Spraying of *neem*-cake water extract at one pound per gallon of water has been found to be an effective remedy against citrus leaf miner and citrus canker at Kodur.

At Kodur again, sweet orange orchard weed flora can be effectively suppressed by monthly sprays of the chemical T.C.A. at 80 pounds per acre.

TEMPERATE FRUITS

At Kulu (Punjab), stratification of apple seed during November and December and sowing in January following has resulted in maximum germination. Budding in June and grafting in February were found to be the best months for vegetative propagation of this fruit at Mashobra. On the other hand, in the drier hill areas of Himachal Pradesh, budding in August has given the best results. At Mashobra, again, high percentage of cherry seed germination has been obtained by storing the seed in moist sand after extraction and subjecting it to low temperature in winter prior to sowing in February. Vegetative propagation of walnuts by patch budding during June and July has been successful in the dry zone areas of H.P. At Chaubattia (H.P.), the chestnut has been successfully budded by the forkert method in August and September and by crown and cleft grafting in March.

Rootstocks selected as useful for the different fruits in the Shillong area (Assam) are as follows: Apple—*Malus baccata*; Plum—wild plum of Khasi hills; Pear—*Pyrus khasiana*. At Bangalore (Mysore), vigorous broad-leaved English Malling I has proved to be a suitable rootstock for Rome Beauty, Glengyle Red and Christmas apple varieties.

At Chaubattia (U.P.), the following polleniser varieties have been recommended for ensuring satisfactory fruit set for some of the more important apple varieties: Winter Banana and Jonathan for Early Shanbury; King of Pippins for Delicious; Delicious, King of Pippins and Winter Banana for Jonathan. The Japanese plum has been found to be compatible with the Maynard plum.

At Chaubattia (U.P.), twelve-year old bearing apple trees respond well to a dose of 4 lb. of single superphosphate per tree. At Bangalore, 50 lb. of sheep manure, 2¼ lb. of superphosphate and 9 ounces of sulphate of potash per tree are recommended.

Thinning of fruits to retain three or four per spur is the most economical practice to ensure satisfactory fruit size without loss of crop in apple Rome Beauty at Bangalore.

The San Jose scale pest of fruit trees has been controlled by diesel oil emulsion spray with 6.25 per cent oil content. Basudin 1 : 640 has proved effective against the woolly aphis pest of apple. Biological control with a parasite, *Aphelinus mali*, has also proved to be feasible.

GRAPES

Great potentialities exist in the country for extending grape cultivation. With proper horticultural techniques, it is possible to grow grapes even under somewhat adverse climatic conditions. The grape industry is expanding fast in the States of Maharashtra, Andhra Pradesh, Madras and Mysore while efforts are being made in the Punjab and Rajasthan to establish it on sound lines. Recently, intensive cultivation of raisin grapes has been taken up in the Kinnaur district of H.P.

Selection Nos. 7 (Pandhari Sahebi × Phakdi) and 94 (Pandhari Sahebi × Bhokri) are promising types isolated at Poona and they are being recommended to growers being superior over their parents.

A close spacing of two feet between the vines and eight feet between the rows has been found useful at Poona for obtaining increased yields in the first 5 to 7 years of life of the vine yards.

In varieties *Anab-e-Shahi*, Muscat, Seedless and Kandhari, retention of 4,5,7 and 5 buds, respectively, on pruned shoots has been generally conducive to optimum crop production at Aurangabad.

Root pruning in grapes has been found to be a deleterious practice and should be given up.

A seedless variety of grape known as Pusa Seedless at I.A.R.I., New Delhi and Bedana in the Punjab has been found suitable for cultivation in Delhi and Punjab.

OTHER FRUIT CROPS

A chance seedling of Honey Dew variety of papaya, spotted out at the Fruit Research Station, Coorg and named Coorg Honey Dew, when raised from seed, invariably results in the production of hundred per cent female or hermaphrodite plants.

The Horticulture section of the Coimbatore Agricultural College has evolved a dwarf variety of papaya called Co[1] Papaya (Ranchi), which is a very economic type and deserves wider trials.

In Assam and Maharashtra, pineapple varieties Kew and Queen are commercially successful.

Pomegranate selection GBG No. 1 and Dholka are promising for commercial growing in western India. In Andhra Pradesh, varieties *Vellodu*, Papershell and Spanish Ruby are being recommended.

Poona and Ischia varieties of fig are figuring as commercial varieties in Maharashtra.

Pala sapota, in Andhra Pradesh, Calcutta Large and Cricket Ball in West Bengal, and *Dwarapudi* and *Kirthibarathi* in Madras State are recommended selections. *M. hexandra* (Khirni) and Sapota seedling rootstocks are compatible for grafting sapota scion varieties while *Bassias* are not useful.

Early Large Red, Seedless, Rose Scented, Calcutta and Late Large Red litchi varieties are promising in the Punjab.

By treating the fruits and vegetables with 6 per cent fungicidal wax emulsion, their storage lives can be increased by about 50 per cent at room temperature.

The avocado pear (butter fruit) is doing well under Coorg conditions and the yield per tree is over a hundred fruits in the seventh year. This fruit deserves wider trials under similar situations.

In Kerala, Planoffix at 15 p.p.m. was helpful in advancing the flowering of pineapples.

To plant seeds and watch the renewal of life—this is the commonest delight of the race, the most satisfactory thing a man can do.

—Rudyard Kipling

PROTECT YOUR APPLE ORCHARD FROM SCAB

APPLE SCAB or Black spot disease is known to be present in all countries where apple is grown. In India, this disease causes a great deal of loss in apple orchards, particularly in Kashmir. The *Ambri* variety of this fruit has been found to be highly susceptible to this disease.

SYMPTOMS

Apple scab affects both the leaves and the twigs. On young foliage, the spots are inclined to have a radiating appearance with a feathery edge while on older leaves the lesions are more definite in outline. As the infected leaf ages, the tissues in the neighbourhood of the Scab spot thickens, resulting in an upward bulging of the Scab area, with a corresponding cuplike depression on the lower surface. The leaf blade may become curled, dwarfed and distorted as a result of heavy infection. This disease sometimes affects the fruit in all stages of its development. Even the flowers are infected by this disease.

When severely attacked, the disease causes great damage to the fruit, rendering it unsaleable in the market. The affected fruits, fall early, especially when lesions appear on the stalks, and if they remain on the tree, they become misshapen and often cracked. On the fruit, Scab frequently occurs on the tips of the sepals and the indistinct grayish lesions are often overlooked because of hairy covering at this stage. Later in the developing stage of the fruit, the spots become more clear and definite. The spots in early stages of the growth of the fruit are usually smaller and darker in colour than those on the leaves. But they soon become almost black, varying from a light olive green to a deep brown, depending in part on the abundance of spores. The spots produced early often serve as sources for later infection, and frequently one or two large spots on an apple are centres round which numerous minute spots appear. Again, infection may occur immediately after the picking up of the fruit, producing lesions invisible to the naked eye which may continue to develop in the store, resulting in "Storage Scab". These spots look different from those which develop on the young fruit.

WEATHER INFLUENCE

The weather conditions have a profound influence on the degree of infection during the developing stage of the fruit. Wet cloudy weather, particularly near the blossoming period encourages the outbreak of Scab. The type of soil, cultivation, manuring, mode of pruning and the rootstock, all have some influence on the intensity of infection. All varieties of apples are also susceptible to infection but some varieties are more severely attacked than others.

CONTROL

Two chief methods adopted for the control of Scab are: (a) general sanitation which includes collecting and burning, or burying falllen leaves in autumn, and pruning which opens up the head of the tree to light and air, and removes scabbed shoots (b) spraying to protect all new growth as it develops.

Generally speaking the growers place more reliance on spraying which if carried out thoroughly, leaves little infection not only on the fruit but also on the foliage and shoots. To obtain best results, spraying is done at four stages of the development of the tree: (1) (when the flower buds are clustered in the rosette of leaves)—the "green bud" stage; (2) when the petals are showing boldly but the flowers still closed—the "pink-bud stage"; (3) immediately the petals have fallen—"petal-fall stage" and (4) two to three weeks after petal fall. Usually these four sprayings should suffice, but later ones can be given if necessary. With regard to spray fluids, the growers have a choice between Bordeaux mixture or lime sulphur or of their various substitutes which are available in the market from time to time. Copper sprays and dusts are not generally safe on apple and they are not widely recommended.

(I. J. D.)

YOUR GARDENING PROBLEMS

Q: My double tuberoses are not flowering regularly. What steps should be taken to ensure their regular flowering?

—M. N. Saha
Ballarpur (Midnapore)

Ans: Irregularity in flowering of double tuberose could be due to many reasons such as unequal size of bulbs at the time of planting, insufficient manuring and adoption of proper cultural practices. Manuring with liquid cowdung is known to give uniform flowering. Another precaution to be observed is to restrict irrigation during flowering.

Q: What measures do you recommend for the control of *Arbella titrianeous* in guava?

—B. M. Singh
Fatehpur (U. P.)

Ans: It is a bark-eating caterpillar which bores the stem and bark. The control lies either in forcing out the caterpillars from the holes by hooked wires or destroying them by injecting dilute kerosene or petrol or chloroform or carbon disulphide, and then covering the holes with wet clay.

Q: How much quantity of manures and fertilizers are required for pineapple?

—U. N. Goswami
Gauhati

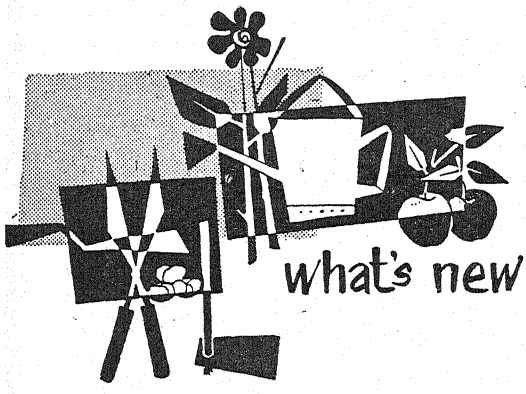
Ans: Normally 25 to 30 cartloads of farmyard manure is applied as basal dressing. This should be followed by a top-dressing of fertilizer mixture of 50 lb. of ammonium sulphate, 220 lb. superphosphate and 40 lb. sulphate of potash per acre. This mixture should be applied in two equal doses, once during March-April at the time of flowering and again with the advent of monsoon.

In a poor soil, the quantity applied may be increased while in rich soil, the same may be proportionally decreased.

Q: Kindly recommend some better varieties of Litchi?

—Lal Chand
Dehradun

Ans: For commercial growing, the suitable varieties are: *Early Large Red*, *Rose Scented*, *Gulabi*, *Kalkattia* and *Late Seedles*. The last two are comparatively resistant to hot winds '*Loo*' and can very well be grown in the hotter regions of the country, provided sufficient water is available for irrigation.



what's new in horticulture

SHOT-HOLE-BORER FOUND IN APPLE TREES

Some of the most serious and destructive forest pests belong to Scolytidae family of which the shot-hole borer (*Scolytoplatypus raja Blandaf*) is one. Recently, this shot-hole borer which is a reddish black beetle about 2.5 mm. long and half as wide, was come across in some apple trees in Kotgarh, Himachal Pradesh, causing quite serious damage to the trees. The infestation, however, was found to be localised.

The shot-hole borer gets its name from the shot-hole-like perforations it makes in the branches and stem of the tree. When a tree is highly infested, wilting and yellowing of the foliage occur, eventually leading to the death of the tree itself. The infested branches emit a foul odour when they are cut.

Metasystox (Concentration: .025 to .375%) was used as a spray over the infested parts of the apple trees in Kotgarh, and was found to be quite effective. The treated trees began to put on new colour and healthy foliage.

SEED-GUN PLANTS PINE

Forest researchers in Alberta are experimenting with plastic "bullets" to plant lodgepole pine seedlings, an idea originated by a university forester, that makes possible the use of a planting gun to drive the bullets into the soil.

A research forester at the University of British Columbia developed the technique of growing and planting tree seedlings in bullet-shaped plastic cups. The plastic containers two and a half inches long are driven into the soil with the seedlings inside. They are so designed as to permit the small trees to grow out of them. Seedlings only eight weeks old can be planted successfully by this method without disturbing the root system, in contrast to ordinary nursery-grown stock, which is transplanted first in the nursery and again on transfer to reforestation areas.

If the "bullet" technique proves successful in the field trials under way at Hinton, Alberta, it could be applied to reforestation and the restocking of forest stands.

STORING ORANGE

Experiments conducted in Maharashtra has revealed that fully ripe *Nagpur* oranges or *Santras* can be kept in cold Storage for three months at 40°F. It has been observed that during storage, the taste of the fruit remains practically unaltered. The loss of fruit during storage is also negligible provided oranges are carefully selected before storing and all bruised fruits are rejected.

It was noticed that *Mosambi* is best stored at 52°F. The *Malta* oranges and *Khagzi* limes can be stored in good condition for one month and two months at 40°F and 52°F respectively.

A NEW BOTTLE-GOURD

The Indian Agricultural Research Institute, New Delhi has evolved a new variety of bottle-gourd. This new variety called as Pusa Summer Prolific is suitable for growing as a summer crop. It is also suitable for growing in the rainy season.

Known for its heavy bearing, each plant of Pusa Summer Prolific gives as many as 10 to 15 well sized fruits. Each fruit measures 16 to 20 inches in length and eight to ten inches in growth when younger and tender. When fully mature, the fruit grows upto 30 inches in length.

To get good yields of this variety at least 20 cartloads of cattle manure per acre should be applied, and a mixture of 100 pounds of ammonium sulphate, 250 pounds of superphosphate and 80 pounds of sulphate of potash applied at the time of preparing land.

The sowing for summer crop is done from middle of October to middle of March while for rainy season crop, sowing is done during June and July.

CITRUS STUNTING CURE

Three scientists of the University of California have found the cause and cure of citrus stunting.

Chiefly a problem affecting citrus nurseryman, stunting occurs after treatment of soils to kill harmful organisms.

It has been discovered that the treatments, such as chemicals, dry heat and steam (to kill soil organisms) produce a substance that inhabits phosphorus absorption. Zinc and copper absorption is also reduced, sometimes to a deficiency level.

Meanwhile the plants may suffer tip and marginal burns of leaves because sodium, lithium, and boron unaffected by the soil treatment are reaching the plant tissues in excessive ammounts.

The cure lies in extra phosphorus fertilization. Two tenths of a pound of actual phosphorus per cubic yard has prevented the problems in soil studied. This amount is in addition to phosphorus that a grower may normally apply. Zinc and copper fertilization may also be required, either in the soil or as a foliage spray.

Gardening Notes

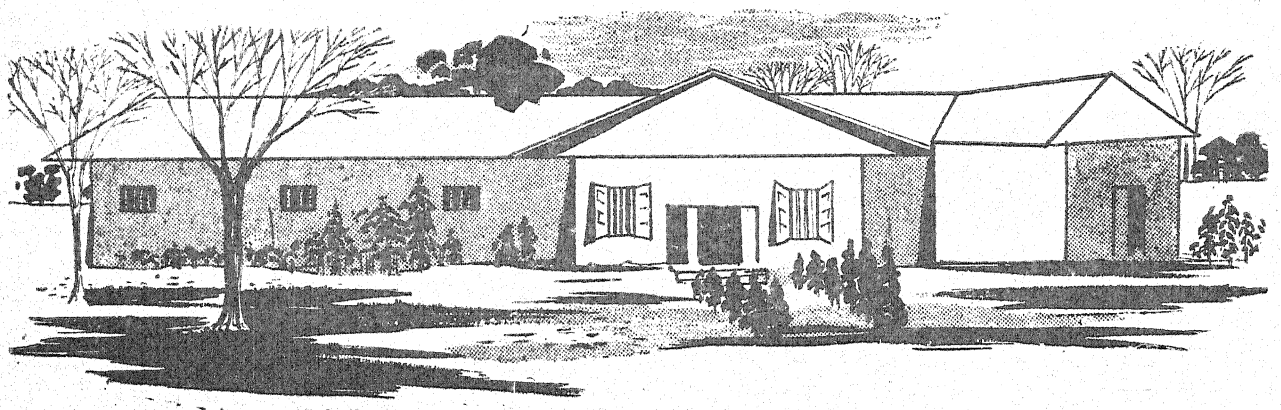
(Jan.-March)

Raise Chrysanthemum Of Your Choice

Chrysanthemum is often called the Autumn Queen as it blooms in November and December when usually there is not much colour in the garden. In our country, it has assumed economic importance also as cut flower for garlands, *veni* etc., like marigolds and roses. In chrysanthemum, which is generally asexually propagated from cutting or suckers, there are numerous varieties, many of which are either similar or are only slightly different from each other in their appearance. Often, it is useful to know the name of the variety which is to be grown, as, the cultural practices, particularly the dates of stopping and disbudding and the number of stoppings needed, and the crown bud (first or second) to be retained, differ from variety to variety.

In November this year, the Delhi Agri-Horticultural Society in collaboration with the Division of Plant Introduction, Indian Agricultural Research Institute, New Delhi, held a display of several new named varieties of chrysanthemums. These were introduced recently by the Division of Plant Introduction, I.A.R.I. The varieties displayed included a few outstanding and famous ones like the pompons Fairie (light pink) and Cameo (the best white), the incurveds Ron Shoesmith (white), Vera Woolman (primrose yellow), Jacqueline Woolman (yellow), Audrey Shoesmith (deep pink), the incurvings Fred Shoesmith (white), Shirley Prime rose (pale yellow) and Marie Brunton (yellow) and the decorative Peter May (purple). This display helped the amateur growers to acquaint themselves with some of the important varieties.

It is during January—March that the new plants of chrysanths are raised from suckers or cuttings and this is an important period for chrysanthemum culture. To obtain quality blooms it is necessary to take precaution at each step of cultivation. In January, after the flowering is finished, the plants can be headed back to about two inches from the ground level to promote the growth of suckers. These suckers can be planted in 3" pots. Cuttings, if required, can be obtained from the suckers. The time of starting the suckers or cutting varies with the variety and also the time when the blooms are required. Even a good variety may fail to perform well if the proper cultural practices are not followed. Perhaps there is no other flower than the chrysanthemum in which the different varieties are so exacting in their requirements in respect of their cultural practices.



ANNUALS

Most of the annuals will be in full bloom during February. A few sown earlier will start flowering in January. Regular watering, weeding and hoeing will be necessary in beds. Withhold water in March in those beds of winter annuals which have finished flowering. Faded flowers must be removed continuously to induce more flowering. Some of the summer season flowers like Zinnia, Gaillardia, Kochia, Portulaca, Sunflower etc. can be sown in February.

BULBOUS PLANTS

Withhold water in Narcissus, Dahlia, Gladiolus, Freesia etc., after these have finished flowering. Bulbs of Caladium, Gloriosas, Zephyranthes and Tuberoses can be planted in March.

ROSES

Budding of roses can be continued till March. During January and February, cuttings of Edoward rose may be planted for raising rootstocks. The rose beds should be watered, hoed and weeded regularly. Application of liquid manure during flowering is beneficial. Disbudding and removing of faded flowers are necessary to obtain a large number of quality blooms for a longer period. Occasional spraying with Basudin, one ounce in four gallons of water, will help to control aphids and other insects. After the flowering is over in March, remove the potted roses to shade to avoid the scorching sun of summer months.

—VISHNU SWARUP

A branch laden with rich fruits of Red Delicious variety of apple which is very popular in the hilly regions of the Punjab

DEVELOPING FRUIT INDUSTRY OF THE PUNJAB HILLS

K. KIRPAL SINGH
Fruit Specialist, Patiala, Punjab
and
J. S. JAWANDA
Assistant Horticulturist, Patiala

The hilly tracts of the Punjab, comprising the districts of Kangra, Simla and Lahaul and Spiti as well as certain places of Gurdaspur and Hoshiarpur possess in many parts, ideal conditions, by way of congenial climate, high elevations, fertile soils, adequate rainfall and perennial water supply for the cultivation of temperate fruits, popularly known as hill fruits. At several places, especially in the Kulu Sub-division of Kangra district, a flourishing fruit industry has been developed, where fruits of superb quality comparable to the best in the world are being grown on a commercial scale. In other tracts, the hill fruit industry is coming up fast.

Fruit cultivation in the hills, besides meeting the existing acute deficit of these most delicious and nutritious fruits, is a far more remunerative profession as compared with the growing of ordinary crops. Even small land-owners can derive decent incomes from their orchards ranging from Rs. 1,000 to Rs. 1,500 per acre. Soil erosion which is one of the major problems of these tracts, is also minimised if the area is put under fruit trees instead of farm crops. The betterment and uplift of the hill people, who are proverbially backward and poverty-stricken, lies in their taking to fruit farming.

PRESENT POSITION

Hill fruits cover a much greater proportion of the world's fruit acreage in comparison to the tropical and sub-tropical fruits. In India, however, these fruits are at present grown only in a limited area, which is estimated at about 42,000 acres, representing hardly 2.5 per cent of the total fruit area in this country. India has an estimated annual production of only 3.8 million maunds in the total yearly world production of 645 million maunds of fruits.

The present level of consumption of the temperate fruits is appallingly low in our country. In 1941-42 the per capita consumption of apple, pear, peach, plum, apricot and cherry was only 0.1, 0.2, 0.1, 0.05, 0.05 and 0.008 lb., respectively. These fruits are therefore beyond the means of the bulk of the population due to their scarcity and the very high prices at which they usually sell.

Among the States growing the temperate fruits, Jammu and Kashmir with an acreage of about 31,500 acres, leads the rest. Uttar Pradesh with an area of 6,500 acres occupies the second place. In Himachal Pradesh, rapid development of hill fruit culture has taken place during the last decade. In the Punjab also, the hill fruit industry has registered a phenomenal progress in the last decade, especially under the impact of the Second and Third Five Year Plans. The area is now estimated at 3,700 acres (Kaura, 1962).

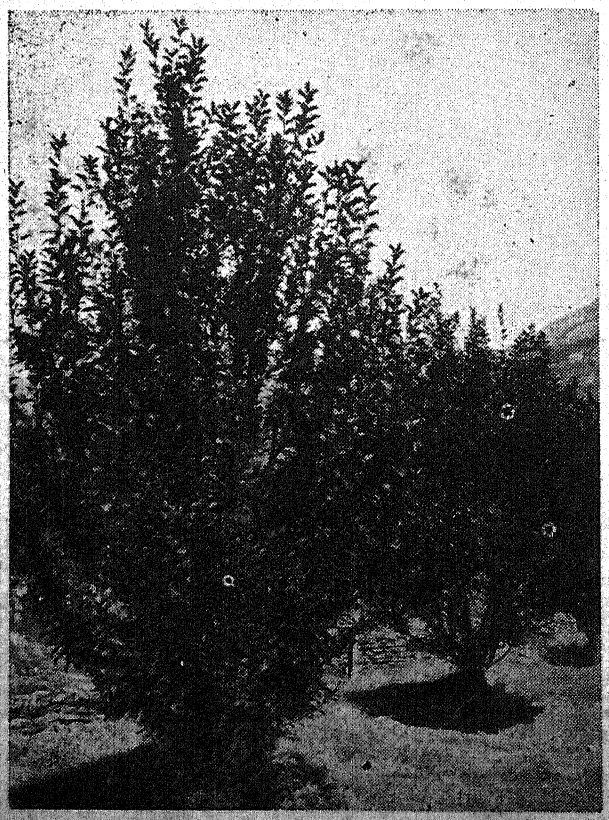
IMPORTANT FRUITS GROWN

The hilly regions of the Punjab grow a variety of fruits at different elevations and hill aspects. Most important ones are apple, pear, persimmon, cherry, walnut, plum, peach and apricot. To begin with, innumerable varieties were introduced by the early settlers in the Kulu valley and by the Horticulture Department in the erstwhile Patiala State—now a part of the Punjab State. After years of trials, some of the varietes with poor performance were discarded. The present position with regard to the main fruits, and the promising varieties in each case are briefly discussed below.

THE APPLE

The apple occupies a premier position in the hilly areas of the Punjab. It alone accounts for about 75 per cent of the area under hill fruits. Fresh apple can be transported to distant markets as it has excellent keeping quality. The Europeans introduced mostly sub-acid varieties like Ribston Pippin, Cox's Orange Pippin, Baldwin, Jonathan, Red Astrachan, Yellow Newton, Granny Smith, Rome Beauty, etc., some of which are no longer commercially popular. The latest trend is to go in for the varieties of the 'delicious' group, more notable among which are Golden Delicious, Red Delicious, Royal Delicious, Winter Delicious and Richard. Among the old varieties, Baldwin, Black Ben Davis, American Mother and Jonathan continue to be quite popular.

Young apple trees at the Horticultural Research Station, Kulu. More than 70 varieties collected from various hill regions of the world are under trial at this station



The apple flourishes on elevations ranging between 4000 and 8000 ft. It does not, however, relish high rainfall, which adversely affects the quality of the fruit.

Next to apple, the pear is most important though recent tendencies are towards planting of other fruits like the persimmon and the cherry. In Kulu valley, Bartlett is the main variety grown which is also known as William pear. The names of a few other good varieties are: Doyenne du Comice, Easter Beurre, Winter Nelis, Conference, Merie Louise. Being a perishable fruit, its marketing is not free from difficulties.

THE CHERRY

The cherry prefers a cooler climate and is grown successfully at higher altitudes ranging between 6,000 and 9,000 ft. The Kulu valley grows finest quality cherries. The fruit ripens earliest of all the temperate fruits in the month of May. The varieties found most promising are: Pink Barly, White Heart, Black Heart, Red Sweet and Early Rivers.

This fruit, though recently introduced, has become very popular. It requires a mild climate and grows perfectly well at elevations between 4,000 and 6,000 ft. The present bearing persimmon trees in the Kulu valley and elsewhere were mostly imported from Japan. Ever since the technique for the propagation of persimmon was perfected at the Horticultural Research Station, Kulu, a large number of its fruit plants have been supplied to the growers. *Hachiya* is a commercially popular variety which is astringent when firm but honey-sweet and excellent in quality when soft. The other important varieties are: Delicious, Twentieth Century, Hyakume, Fuya and Jiro. Still a rare fruit in India, its popularity has been increasing steadily.

PEACH, PLUM AND APRICOT

These fruits can grow well even at lower altitudes ranging from about 3,000 to 6,000 ft. The quality of peach grown in the hills is superb but the peach leaf curl and the very perishable nature of its fruit are the two main obstacles in the way of expansion of peach cultivation. Elberta, Babcok, C.O. Smith and J.H. Hale are the four well known varieties of peach.

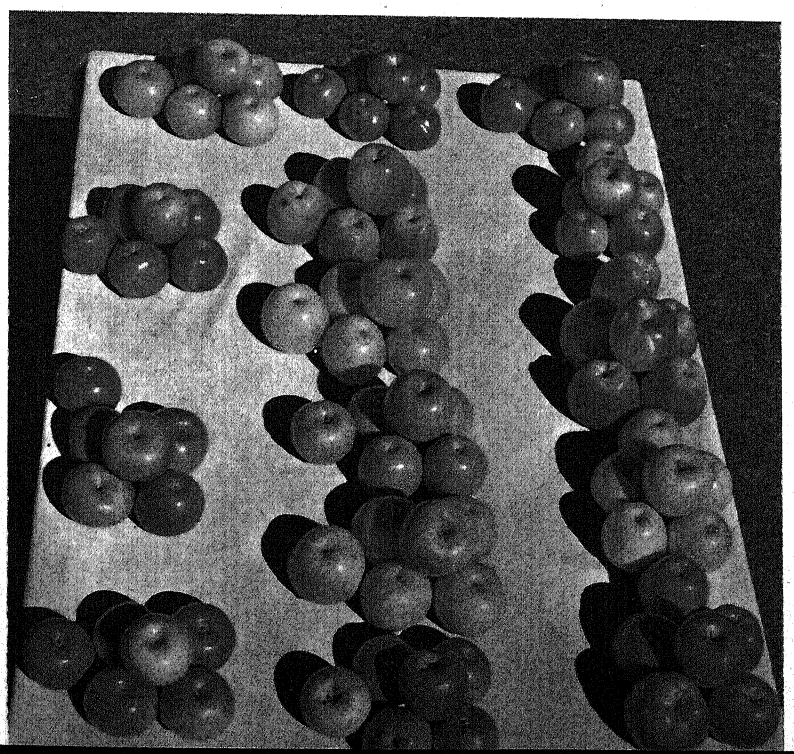
The plum is quite hardy and can be grown sucessfully. Important varieties are Santa Rosa, Formosa, Mariposa, Methley, Kelsey and Beauty.

The apricot tree is very hardy though its fruit is a poor keeper. Some of its important varieties are Shipley Early, Royal, Soffaida, New Castle, St. Amroise.

CONTINUED ON PAGE 28

Sweet Cherry—A luscious variety grown in Simla Hills.

Photo — S. J. Sharma



FRUIT CULTIVATION IN THE HILLS

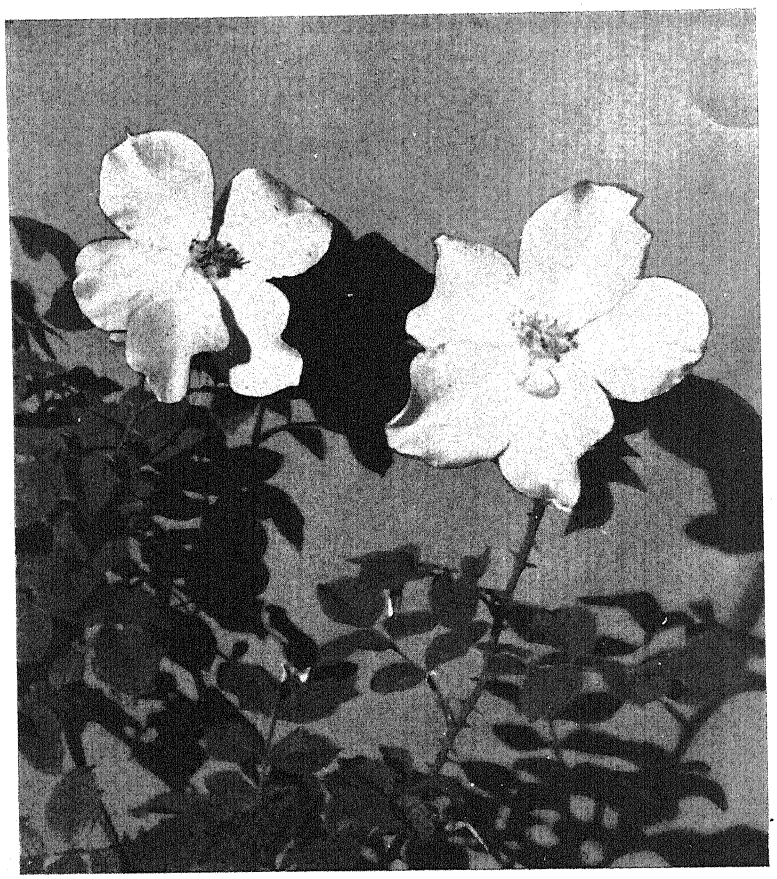
Apple fruits of some of the most popular varieties grown in the Kulu Valley. The varieties are Red Delicious, Golden Delicious, Winter Delicious, Granny Smith, Baldwin and Black Ben Davis

NEW SEEDLING VARIETIES OF LOVELY ROSES

YOU MAY BREAK, YOU MAY SHATTER THE VASE IF YOU WILL, BUT THE SCENT OF THE ROSES WILL HANG ROUND IT STILL.

—THOMAS MOORE

Many consider the raising of new rose varieties to be an expensive and time consuming gamble. Nevertheless, rose breeding is a rewarding venture. It affords a good opportunity to select in the highly variable cross progeny a few very enchanting and elegant varieties having exquisite blooms of pleasing colours. For article see page 23.

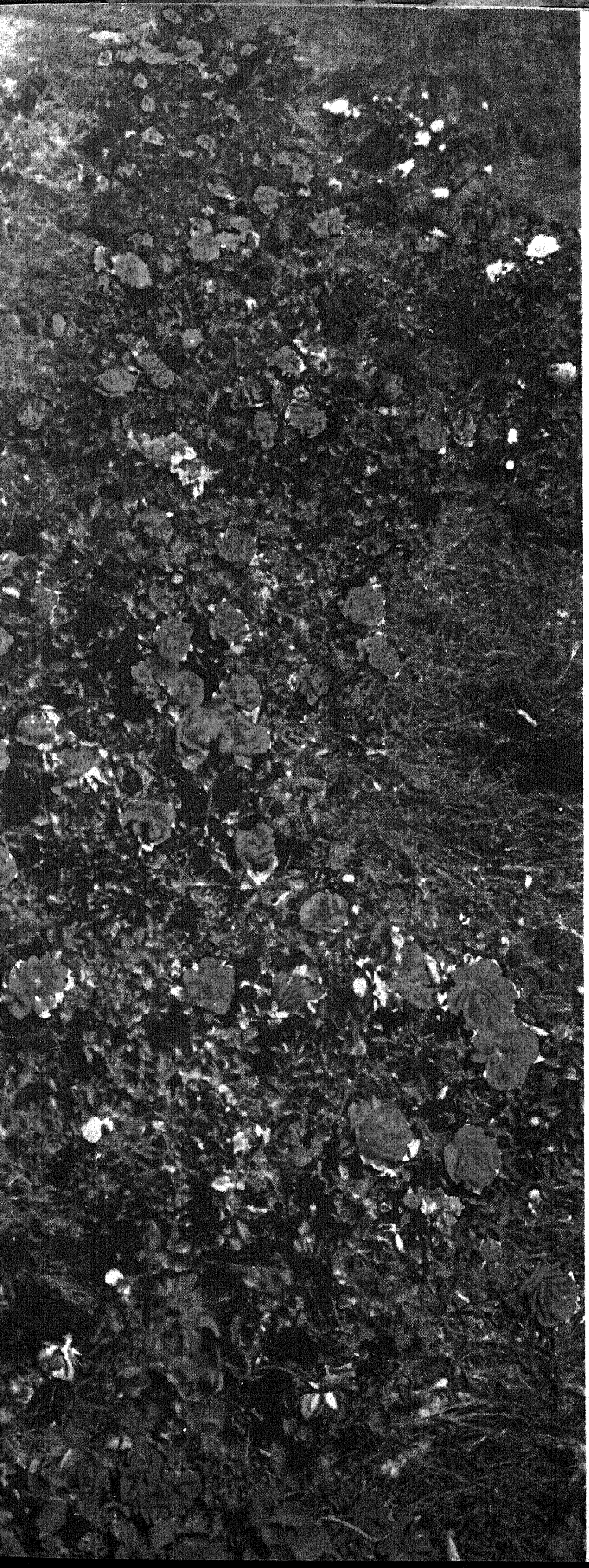


"Delhi Maid" has only five petals and is suitable for decoration work

"Delhi Sherbert" is suitable for a scented hedge →

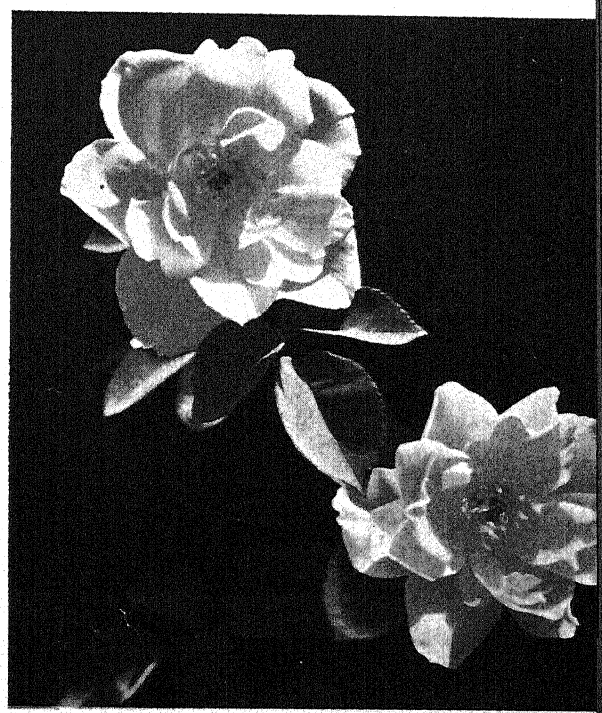
"Delhi Pink Pearl" arose as a natural mutation in a Polyantha rose

"Delhi Sunshine" a new seedling of H.T. type



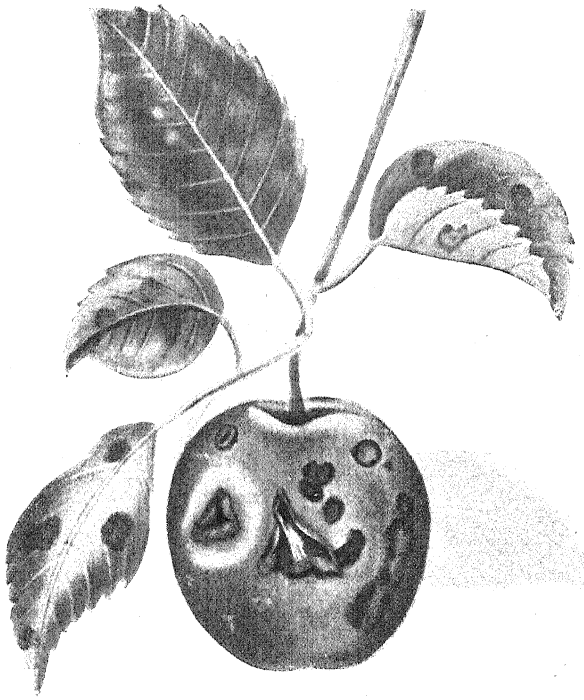
"Delhi Princess", a floriferous new seedling variety

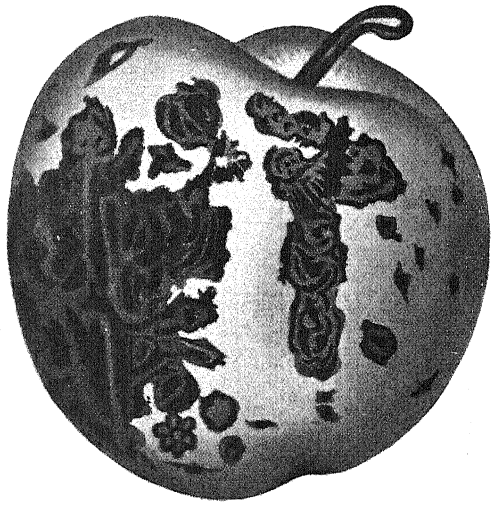
A promising un-named seedling



Photos — H. K. Gorkha

APPLE DISEASE





Apple scab, also known as Black Spot disease, affects the fruit in all stages of its development. (For article see page 11)

THE HARDY CASHEW

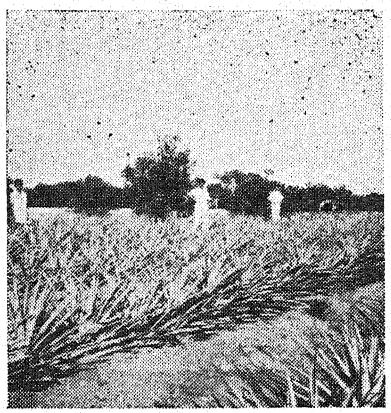
Cashew crop produces wealth from waste lands which are unfit for other crops.

CASHEW DEVELOPMENT IN MYSORE

K. TEJAPPA SETTY
Cashew Development Officer, Mangalore, Mysore

CASHEW, known to have been introduced into the West coast of India by the Portugese settlers about 450 years ago as a soil binder, has now made a name as a commercial crop of importance not only along the West and East Coasts but also in the red soil areas of the *maidan*.

The importance of cashew as a commercial crop engaging over 80,000 workers in the processing factories, and as a foreign exchange earner fetching over Rs. 19½ crores into the country is well known. It is a crop producing wealth from waste lands which are practically unfit for other crops. India today holds the monopoly in cashewnut industry.



Pineapple intercultivated in a cashew garden

Cashew seedling nursery

MYSORE'S ROLE

The present production of cashew in Mysore State is estimated to be only about 8,000 tons of raw nuts per year grown mainly in the coastal districts of South Kanara and North Kanara with a few scattered trees and gardens in the *maidan* areas. This quantity is insufficient to meet the demand of the local factories whose annual requirements are estimated to be 28,500 tons.

The full annual requirements for the existing factories will therefore be 30,000 to 35,000 tons of raw nuts. A quantity of 8,000 to 10,000 tons of raw nuts is being imported at present from East Africa to meet the requirements of the factories in addition to about 4,000 to 5,000 tons imported from other areas into South Kanara.

CASHEW DEVELOPMENT SCHEME

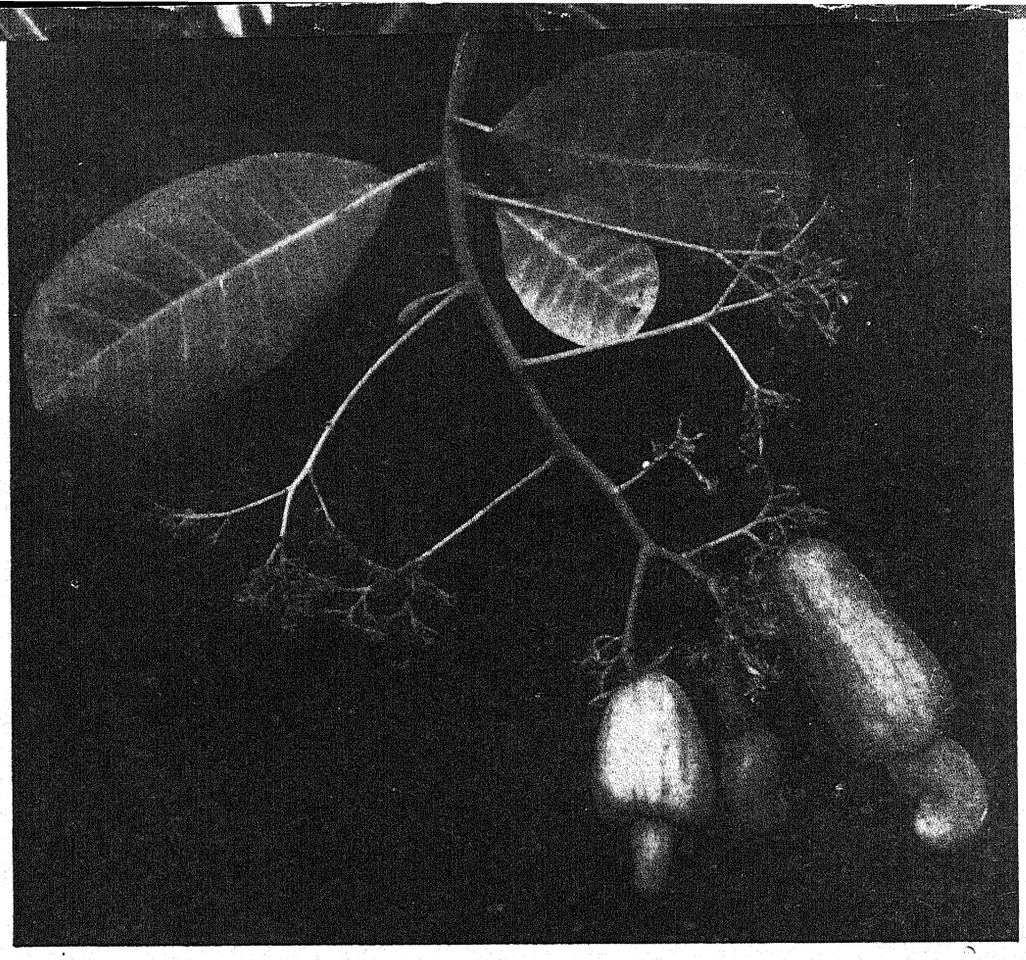
The Scheme, which was started in May 1958, has in its main programme (i) selection and marking of outstanding trees of merit as parent trees to collect seednuts and to prepare air-layers, (ii) collection and procurement of good quality seeds from these parents for distribution and also for raising good seedlings for planting (iii) preparation of air-layers from selected scions of these parents (iv) raising of quality seedlings in a number of Nursery plots on individual containers and distribution of these seedlings for planting (v) guiding and demonstrating the control measures against pests and diseases (vi) giving technical guidance on the cultivation of cashew and (vii) looking to the proper development of the areas leased out or granted for cashew cultivation as well as to the proper utilisation of the amount of loan granted for the purpose.

Loans: Loans are granted for the specific purpose of cashew cultivation at the rate of Rs. 150/- per acre subject to a maximum of Rs. 2,500/- per individual. This loan is repayable in five annual instalments commencing from the seventh year of the date of disbursement of the loan with an interest of 4% per annum.

Land grant: A scheme for lease of waste lands for cashew cultivation was sanctioned by the State Government and an area of 4,801 acres has been leased out in South Kanara for the specific purpose of cashew cultivation, subject to a maximum grant of 25 acres per individual. The grant has been extended in all areas of the state, and, already about 300 acres have been granted in Chitradurga District.

CULTIVATION

Cashew is a hardy tree grown purely under rainfed conditions. It requires a particular heat unit for growth



A typical cashew inflorescence showing the cashew fruit in three stages of development

and flowering. It can be grown in any area except in purely *malnad* parts where the climate continues to be cold for the major portion of the year. Even in areas where rains are scanty, say about 18 inches, it is found to grow and fruit well. It is found coming up well in red laterite soils of the west coast, on the red soils of the interior plains and also on the sandy soils of the east and west coasts. Cashew can be grown on hill slopes on any well drained soil. It is not the crop for deep black cotton soils.

PLANTING

Fencing the area is an essential preliminary work. Seedlings or air-layers may be planted at intervals of 25 to 30 feet in small pits, dug and refilled. Planting should be done with the early soaking rains. Seeds may be dibbled direct but it is better to plant two-month-old seedlings, raised in individual containers of polythene bags or bamboo baskets. For raising seedlings, good genuine seednuts should be selected and only healthy vigorous seedlings should be planted.

INTERCULTIVATION

Give a stake to each plant and provide a mulch round. Provide catch pits to each of the plants on the higher level to conserve moisture in slopy areas and spread the dug out soil round the plants as a mulch every year. Crops like pineapple, ginger, sweet potato, pulses, etc., can be grown as intercrops or catchcrops. To prevent the incidence of diseases it is better to spray Bordeaux mixture (1%) and then spray wettable B.H.C. or D.D.T. one pound in 20 gallons of water to control the pests.

MANURING

Application of manure mixed with N.P.K. will do the plants good. Young plants may be manured with about a quarter pound of ammonium sulphate with the same quantity of superphosphate and muriate of potash. This quantity should be increased gradually for yielding trees. Yield varies widely and may be from anything to 150 lb. of raw nuts per tree with an average yield of 5 to 10 lb. per tree.

WORKING OF THE SCHEME

Second Plan Period: With eight Development Centres, each under the care of a Scientific Assistant, Coondapur, Karkal and Puttur in South Kanara District, Ankola and Kumta in North Kanara District, Sagar in Shimoga District, Gubbi in Tumkur District,

CONTINUED ON PAGE 29

ROSE BREEDING

A FASCINATING EXPERIENCE

B. P. PAL
Director, I.A.R.I., New Delhi

THE creation of new forms of plants is a fascinating subject. In the case of roses, the pleasure is increased manifold by virtue of the nature of the subject. Rose breeding is now done on a very large-scale involving the raising of thousands of seedlings in France, Germany, the Netherlands, the United Kingdom, U.S.A., Australia and in several other countries by nurserymen; in India also, rose breeding has been taken up, and this has gained momentum in recent years. The amateur with only a limited amount of garden space and other resources can, however, derive a vast amount of pleasure by growing roses from seed and selecting the best ones from amongst these. No doubt, the chances of success are much less than in the case of professional rose breeders working for firms, with all the facilities that modern plant breeding requires. However, if one is fortunate, one may bring out something very worthwhile in the shape of a new variety. In fact there are several instances where varieties raised by amateurs have proved very successful.

NEW VARIETIES

There are two ways in which new varieties of roses can be had. First, there may occur a natural mutation or 'sport' as a result of which a plant of an existing variety puts forth a shoot in which a genetical change has occurred. If vegetative propagation is done from this mutated branch, a new variety will result. Many climbing forms of well-known Hybrid Tea roses have risen in this way. It is possible nowadays to stimulate the production of mutations or 'sports' by using X-rays, radio-isotopes, etc. The other method of producing new roses, and by far the more important one, is that of raising roses from true seed which may be the result of artificial or natural cross-pollination. Some hints on raising roses from seed are given here.

ROSE FRUITS AND SEEDS

Many people may not know that roses form fruits which contain seeds. If flowers are not cut off, the lower rounded portion below the calyx lobes will swell and develop into a fruit called 'hip' or 'hep', or sometime 'apple'. Not all varieties however, will do this. Hip formation is particularly plenteous in some of the wild roses, and, since these often become orange or red after ripening, they add to the attractiveness of the bushes. The size and shape of the hip varies with the variety; it may be rather rounded in some, while in others it may be urn-shaped or elongated. The size also ranges from quite small fruits to those which are about the size of a crab apple.

HYBRIDISATION

Roses in nature are usually cross-pollinated by insects, especially bees. When a rose opens and exposes its golden anthers the bees can be seen rolling luxuriously among the anthers, gathering their golden spoil. Seeds from naturally-formed fruits may give a variable progeny, especially in the complex-pedigreed modern

varieties, so that even without resorting to artificial crossing or hybridisation as it is called, new forms may be obtained.

However, for serious rose breeding, the breeder will no doubt attempt to make crosses under controlled conditions, with the object of creating new varieties which will unite in themselves the desired combination of characters. It is necessary to choose the parents carefully. Crossing itself is quite a simple process. Here are the steps :

1. Remove the anthers or stamens from the variety to be used as the female or seed parent with a pair of fine-pointed scissors. This should be done before the pollen starts bursting out of the anthers.
2. Take a flower of the variety selected to be the male or pollen parent and remove the petals. As the anthers begin to burst rub them gently against the pistil or central disc of the flower that is to be used as the seed parent. Alternatively, pollen may be applied to the pistil by means of the tip of the fore-finger or with a small soft brush.
3. Put a butter-paper bag round the cross fertilised flower to protect it; also, attach a small label on which the names of the crossed varieties may be entered (in abbreviated form) putting the female parent first, *e.g.*, Crimson Glory x Buccaneer. It is as well to note the date of the "operation" because if one is doing a number of cross-pollinations during the crossing season, one can tabulate the results and find out the best period for making crosses.

   If several different crosses are to be made, the brush or finger used for applying the pollen, should be cleaned before each operation.

   In successful crosses, the hips will develop and swell, and in due course, become yellow or orange or even red (in a few cases however they may continue to remain green). When these fruits begin to shrivel and turn a little brownish they should be collected and thoroughly dried. If a slit or two is made with a knife, extraction of seeds later will be easy.

SEED SOWING

The fruits when fully ripe are quite hard, and it is not easy to extract the seeds with the fingers. Some rose breeders recommend storing the whole fruits in pans or "flats" in moist soil until they soften naturally after a few weeks. However, if this is done, watch should be kept against damage by rats or insects.

The extracted seeds may be sown about two inches apart, in pans, flats, or even in small plots, the surface of which has been carefully prepared and levelled. Good garden soil, as used for sowing annuals, is quite suitable for roses too. Under Delhi conditions, sowings in October-November have given good results. The seeds may even take several weeks to germinate, and one need not be impatient about it.

When the seedlings are a couple of inches high they can be transplanted into larger pots.

CARE OF SEEDLING

Rose seedlings tend to flower even when they are quite tiny, and thus exhaust themselves. Pinch off the flower buds as soon as they appear until the plants are reasonably big and sturdy. Then allow them to flower and select the better ones for budding on to the Edouard Rose or other root-stocks. It is only after budding that it is possible to assess the comparative value of the new seedlings variety *vis-a-vis* the established varieties.

ASSESSMENT OF NEW VARIETIES

Young seedling varieties can look very beautiful, but is not safe to judge them until they have been budded and grown in a row of at least three plants, alongside the older varieties of similar colour. It must be remembered that a large number of the seedlings will in all probability prove inferior to existing varieties which, after all, represent the best work of accomplished rose breeders all over the world. However, even if one outstanding "break" is obtained it is worth all the trouble. That will proclaim the birth of a new star in rosedom.

(For pictures of new seedling roses please see centre pages—*Ed.*)

The Wonderful World of Bulbs by Bebe Miles; D. Van Nostrand Company, Inc., Princeton, New Jersey ; 1963—*PP.* 348.

Shrubs, trees and flowering herbs have their own charm, but the planting of bulbs in the centre of a garden gives a look unsurpassed. The bulbs of springtime are especially dear. They bloom when the world is eager for colour. They grow with least effort. There are bulbs for every climate, for sun and shade, for dry spots and even a few moist areas. This book 'The Wonderful World of Bulbs" introduces to all these. From the delicate loveliness of springtime scillas and anemons to the striking flamboyancy of summer cannas and richness of autumn-blooming hardy cyclamen, the author takes the readers to the delightful world of bulbs. She discusses in detail all the popular bulbs crocus, daffodils, tulips, hyacinths, lilies, gladiolus, dahlias and also many other less familiar ones. The author also introduces the reader to many varied uses of bulbs. The greatest charms and benefits of bulbs, and their beauty to merge into the total garden picture, have also been fully explored.

The usefulness of this book may possibly be limited to Americans alone, but in fact there is something for everyone about the delightful world of bulbs. The information contained in it on bulbs' heights, their suitable time and duration of bloom, climate, soil, etc., may not conform to Indian conditions, but the discussion on bulbs and its species, popular or less popular, is very instructive and inspiring for all those having a taste for gardening.

Printed on excellent paper in beautiful type, the book is a good guide on bulbs. Profusely illustrated with 19 colour illustrations, 24 black and white photographs and 13 pages of line-drawings, the book is a welcome addition to every gardener's library.

—*I.J.D.*

Fruit Nursery Practices in India; Compiled by L. Venkataratnam; Issued by Directorate of Extentension, Ministry of Food & Agriculture.

This book is a sign of the competence and purposeful direction that is coming into the horticultural sphere of India. Discriminating readers who have an eye for events significant to man, have been for years reading of developments in other countries in this sphere, particularly in America and Soviet Russia.

Potentialities of plant propagation and plant production are now understood. For us, the problem is only one of continuous dedicated work, but availability in a compact form, of results and advances so for registered can be of immense help even to the most dedicated researcher. And to the beginners, its value is indeed even more. The thirty two articles in the book (excluding the useful appendices) deal with nursery practices in various States, and they in turn cover almost all our important fruits. Quite a few of the articles, naturally, deal with methods of propagation of mango, with citrus coming next. Improvements over old methods, all tried and found effective and discussed at length, give these articles considerable qualitative value, and illustrations make them understandable even to the amateurs in the sphere.

Contributions on citrus rootstock experiments are particularly valuable in view of the widespread occurrence of tristeza virus which brings in disastrous consequences.

To romantics, refined enough to flirt with nature, grafting and similar practices can give no end of joy. It is a sphere where commercial intent can harmonize with the highest aesthetic experience. And so, extension work in this sphere can be highly rewarding. This reviewer, therefore. hopes that the solid content of the book is conveyed to the people, farmers and all, in language understood by them. Result will be well worth all the trouble.

—*K. B. N.*

Choice Chrysanthemum and Bright Roses

RESPLENDENT varieties of fascinating flowers were displayed at two different shows on 6th and 8th December, 1963, in New Delhi. These shows were organised by the Y.W.C.A. and the Rose Society of India.

Blooms of varying shapes and sizes ranging from the small buttons and pompons to the majestic incurved and incurving types having soft hues were on view at this year's Chrysanthemum Show put up by the Y.W.C.A. Fifty competitors participated as against 36 last year. The Pompons from the I.A.R.I., the Spiders from Shri Choudhury Jagan Nath, and the Korean doubles and the spoons from Dr. B.P. Pal lent added attraction to the show. The Y.W.C.A. Cup was won by Mr. D.K. Khosla, who also shared Mrs. Gian Khosla Cup with Mrs. Susy Thomas.

Several important old and new varieties of roses were exhibited at the Fifth Annual Rose Show organised by the Rose Society of India. The Patiala Challenge Cup went to the Garden Party displayed by Major Vasishth, and the Show Girl by Shri J.S. Monga was awarded the Rose Society Medal. The Show which is organised every year had the added attraction of 12 varieties especially flown from Australia. Mr. Dharam Vira, Chief Commissioner gave away the prizes to the winners.

A Garden Above London

At a height 100 feet above ground on the roof of Derry and Toms in Kensington, a leading department stores in London, there is a magnificent garden beautifully laid out which provides delightful surroundings for Londoners to relax. Apart from this, there are three other equally beautiful gardens: an old English woodland garden, a walled and paved Tudor garden, and a Spanish garden with Moorish pergolas, which provide a place to rest and respite in the lap of nature; away from the humdrum of life.

Walking in these gardens gives the sensation of seeing something that is very much larger than in fact it is, and it is hard to remember that it is on a roof above one of London's busiest thoroughfares. The Spanish garden, with its sub-tropical plants—palms, yuccas, figs and grapes—is a veritable piece of Mediterranean scenery in the heart of London. A few steps and there is Tudor England, with broad-topped archways and courtyards paved with brick and flagstones, beds of geraniums and white alyssum, fuchsias and rambler roses in full bloom, English lavender, hollyhocks and rudbeckias (to mention a few) in raised borders, and behind them clematis and other vines covering the walls, an old-world garden at its best. From there to the Woodland garden, in which grow elms, birches, chestnuts, apples and other trees up to 30 ft. high; among them little stream meanders and cascades along. Finally, there is a truly English garden in front of the Pavilion where visitors relax over coffee or enjoy their lunch. Flower beds, tall trees and shrubberies, and beautifully-kept lawns make up a scene typical of all that is best in English landscape gardening.

The rooftop 'park' in London provides a galaxy of colour and beauty in the spring and summer months

Lemon Grass Oil

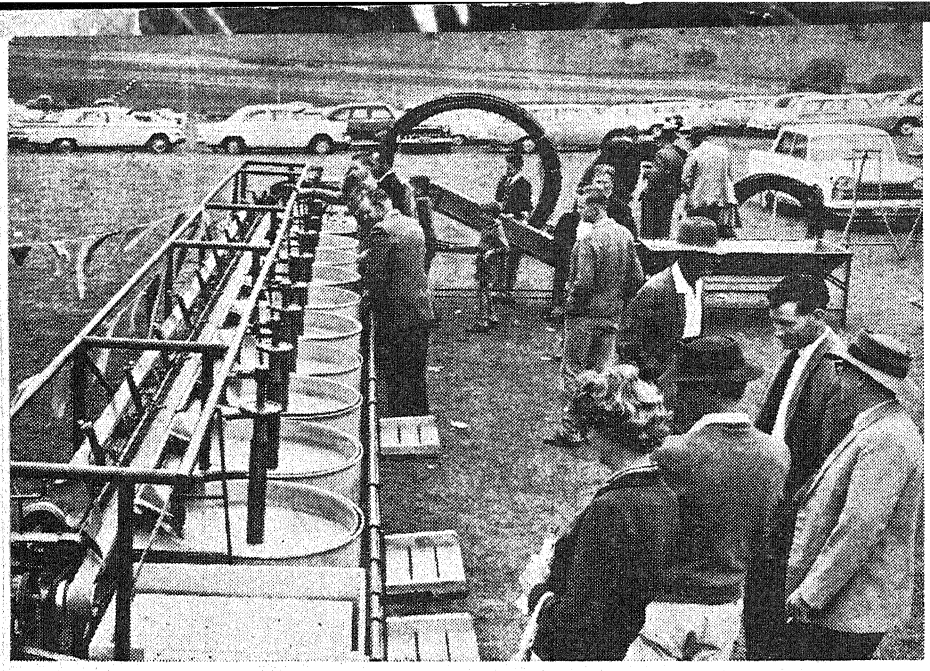
India is the largest producer of lemon grass oil in the world. Mainly produced in Kerala, the exports amount to about 2.5 crores per year. Steps are now being taken to stabilize the industry on very efficient footings.

The Kerala Industrial Development Corporation is formulating a scheme by which the plant would be more completely utilised. A factory is proposed to be set up in Alwaye district to distil oil efficiently and to utilise the spent grass in the manufacture of writing paper. The cost is estimated at Rs. 9.3 crores, which is over three times the annual value of the oil export. The only other country manufacturing lemon grass oil on a large scale is Guatemala.

NEWS ROUNDUP

Electric Fruit Grader

A new type of electric fruit grader was displayed in November, 1963



The 10-bin electric fruit grader has a capacity of about 100 cases of fruit an hour on a single run machine

at an annual Show of Agricultural Machinery, held in the Central West of New South Wales, Australia. The grader was invented by Mr. Norman Mayne of PSF Equipment Pty, Ltd., Queensland. The grader, with 10 revolving bins and one spin bin, is designed to grade apples, pears and odd shaped fruit with greater accuracy and speed than older graders.

Sizing rollers have been eliminated and each bin can be individually adjusted. A single run machine can handle about 100 cases of fruit an hour while double run machines, intended for packing sheds, grades about twice that quantity in an hour.

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FRUIT INDUSTRY OF PUNJAB HILLS

Among the nuts, the walnut is most important and grows well at higher elevations in the range of 4,000 to 7,000 ft. The fruit is in good demand, and there is a marked scope for increasing the area under this fruit, especially in the inaccessible tracts. The fruit can be sent to distant markets.

The pecan nut introduced some years ago by the Department from the U.S.A. is also gaining popularity. This nut is far better in quality than the walnut.

The temperate fruits can be grown in the entire Himalayan region extending to over 1,500 miles with a breadth of nearly 150 miles. This vast region, according to Thapar (1960), can accommodate some 400 million fruit trees or about four million acres under fruits, without seriously disturbing the present acreage under forests and farm crops. In the Kulu valley alone, which runs to about 35 miles in length, there is a tremendous scope for the development of fruit growing on altitudes from 3,500 to 8,000 ft. There is thus an unlimited scope for pushing up fruit culture in the hilly regions of this country. There can be little doubt that with the present emphasis and attention being bestowed by the State Government and the Government of India towards the development of fruit culturein the hilly zones, coupled with the determination of the peasantry of these areasto ameliorate their lot, the fruit-growing in these parts is assured of a very bright future. The very favourable climatic conditions prevailing in many parts and the acute demand for these fruits in the country make hill fruit-growing a highly profitabler profession.

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CASHEW IN MYSORE

and Mysore in Mysore District were functioning during the second plan period. The work was as per programme with a target of 20,000 acres of additional area each year. Collection of good seeds, raising of quality seedlings on individual baskets, and distribution and planting in systematic plantation scale constituted the main work.

Third Plan Period: The number of Development Centres has been increased to 14, extending the work to the districts of Dharwar, Belgaum, Mandya, Bangalore and Kolar. Work has also been taken up in an area of over 150 acres planted in the district of Chitradurga. It is proposed to plant an additional area of 75,000 acres during the Third Plan period at 15,000 acres per year. It is estimated that there will be an additional production of 4,900 tons of raw nuts by the end of 1965-66 valued at Rs. 27,50,000. This additional yield will be on a progressive increase every year, and the area of 1,15,000 acres newly brought under cashew till the end of the Third Plan, is expected to produce an extra yield of 11,500 tons of raw nuts per year valued at a moderate estimate, to be Rs. 64,40,000 per year.

UNSOLVED PROBLEMS

There is no definite data on the manurial requirements of cashew and therefore, no definite progress could be achieved in stepping up production by manuring the plantations. It has been observed, however, that manuring with a balanced manure from the time of planting helps in getting vigorous plants with increased fruit set. Recent observations have shown that flower scorching and dieback in cashew could be checked to a great extent by spraying bordeaux mixture and an insecticide like B.H.C. 50% or D.D.T. 50% at the time of new flush. Further work is necessary in this direction and a definite formula to check flower scorching will help in getting increased yields both from the existing gardens and also in the new plantations.

Mysore is one of the States which has established cashew nurseries and popularised planting of basket seedlings to a large extent. Over 4,00,000 seedlings raised on individual seedling baskets in 70 nursery plots distributed all over the State have been made available for planting.

A progeny orchard-*cum*-demonstration area of cashew has been taken up in Belthangady taluk of South Kanara District, at the instance of the Central Spices and Cashewnut Committee. The committee made the suggestion, three years ago, that air-layers might be propagated from selected high-yielding parent trees for planting in progeny gardens which could be made to serve as a permanent source of pedigree seeds for supply to growers.

Horticultural Abstracts

Abstracted by
P.C. BOSE

I. TROPICAL FRUITS

434. CHADHA, K.L. AND K. KIRPAL SINGH

Effect of NAA, 2, 4-D and 2, 4, 5-T on fruit drop, size and quality of *langra* mango.

The Indian Jour. Hort., **20** (1) : 30-33; March 1963.

Aqueous solutions of NAA, 2, 4-D and 2, 4, 5-T were sprayed at concentrations of 20, 40 and 60 p.p.m. on *Langra* mango on May, 8, 1959. In general the application did not show any effect on the control of fruit drop or increase in fruit size, whereas, 40 p.p.m. of 2, 4-D gave the minimum fruit drop of 15.74 per cent out of all concentrations of these three plant regulators applied, 2, 4-D as a whole with an average fruit drop of 19.13 per cent possessed to some degree the desirable quality of curtailing fruit drop. Under no treatment except 40 p.p.m. 2, 4-D the fruit drop was significantly different than that under control which was 24.88 per cent. The treatments in general did not have any effect on T.S.S., or acidity, though 60 p.p.m. concentration of all the regulators slightly reduced acidity. Almost all the treatments increased the ascorbic acid content, the maximum increase being in 40 p.p.m. 2, 4-D followed by 60 p.p.m. 2, 4-D.

435. TRIPATHI, R.D. AND SHARMA. K.N.

Effect of spreaders and PH on the absorption of urea by mango foliage.

The Indian Jour. Hort., **20** (1) : 38-42; March 1963.

Five six-year-old mango trees of variety *Dashehari* were selected, and on each of them, a group of four shoots originating from the same point and, therefore, having the same age were tagged. Thus, a total number of five such groups of four shoots each were selected on all the four trees. On each of the shoots, sixth leaf from the bottom was tagged for applying the treatment.

Glycerine in all the concentrations depressed the absorption of urea by young and old mango leaves. Triton B-1956 and Tenac depressed urea absorption in very young leaves of pink colour at 0.1 per cent concentration, while they showed enhanced absorption at 0.02 and 0.01 per cent concentrations with older leaves of deep green colour.

PH 2.60 gave the highest absorption of urea as compared to PH 4.25 and PH 7.60 which showed variable and, therefore, inconclusive response.

II. SUB-TROPICAL FRUITS

436. SINGH, B.P. AND M.J. SOULE J.R.

Studies in Polyembryony and seed germination of trifoliate orange (Poncirus trifoliata).

The Indian Jour. Hort., **20** (1) : 21-29., March 1963.

For polyembryony and seed germination studies, seeds were obtained from fresh trifoliate oranges immediately before use. To study germination of trifoliate seeds, seeds were placed in petri dishes in which filter paper discs were sterilized in 1:10 clorox solution. Equal number of seeds (20) were replicated 5 times and were placed in dark and light to determine the effect of dark and light on germination.

To gain knowledge about polyembryony and germination of trifoliate orange seeds, a study included fourteen pre-soaking treatments, different concentrations of GA, different hours of running water, and count and measurement of embryos per seed.

The average number of embryos per seed was 1.64 while the average length was 1.81 mm.

32 per cent of the seedlings of P. trifoliata were small and bench rooted. In the nursery rows, 15 per cent of the seedling population was considered variants or "culls" of small or large types.

Germination of embryos varied with their size and it was reduced considerably with the decrease in size.

GA application (10^{-6}m), washing of the seeds for a certain length of time (24 and 48 hours) in running water, seed coat removal, and treatment with 8 hydroxyquinoline sulphate, increased the germination capacity of seed. This significant influence might be due to either removal of seed germination inhibitors or checking of the micro-organisms.

437. DHILLON, J.S., K. KIRPAL SINGH AND BAKSHI J.C.

Investigations on Flowering and Fruiting Problems in Sweet Lime (C. limettioides Tanaka).

The Punjab Horticulture Journal **3** (1) : 46-53; Jan.-March, 1963.

Sweet lime was found to be fully self-compatible. It invariably gave highest percentage of initial fruit-set with its own pollen. However, the crop taken to maturity was lower in the case of hand-selfing as compared to cross-pollination with the *Musambi* variety of sweet orange and the Dun an and Foster varieties of grapefruit wherein the initial fruit-set was lower than selfed flowers.

The pollens of the *Musambi* variety of sweet orange and the Duncan and Foster varieties of grapefruit increased strikingly the seediness of crossed sweet lime fruits, which goes to explain their improved rentention because seeds are known to be the seats of hormones or hormonal substances. These pollen parents, particularly the grapefruit, also increased the fruit size and skin thickness in a significant manner and exhibited clearly their metaxemic effects.

The fruit-set under open pollination and in the case of bagging of flowers in clusters was nearly similar. However, when the flowers were individually bagged the fruit-set was severely lowered.

The studies on pollination indicated the possibility of improving the ultimate cropping in sweet lime by sandwitching their plantation between blocks of either Duncan and Foster varieties of grapefruit or the *Musambi* variety of sweet orange.

The increased seed content and improved fruit retention suggested that hormonal sprays may prove helpful in improving fruit retention.

438. PAGE, A.L., MARTIN J.P. AND GANGE, T.J.

Foliar absorption and Translocation of Potassium by citrus.

Proc. Amr. Soc. Hort. Sci., **82** : 165-171; 1963.

The results of green-house and field studies have shown that the K content of citrus leaves can be increased markedly by using foliar applications of KNO_3 solutions, and that the foliar absorbed K is readily translocated to new growth. The KNO_3 sprays had little or no effect upon the levels of Na, Ca and Mg in the leaves.

III. TEMPERATE FRUITS

439. GILBERT, ALFRED HOLLEY

A study of skin development in the McIntosh Apple.

Proc. Amr. Soc. Hort. Sci., **82** : 45-50; 1963.

This study of skin development in the

McIntosh apple show, (a) that in the earliest material studied there are 2 initial layers of pistil wall tissue, an outer and an inner, which become respectively the epidermis and the hypodermis; (b) that these layers by cell growth and divisions become the skin of the mature apple; (c) that cell division in the epidermis are anticlinal throughout while those of the hypodermis are both anticlinal and periclinal; and (d) that features of cell wall and cell contents as revealed by differential staining, serve to identify skin tissue throughout the development of the fruit.

440. BATJER, L.P. AND WESTWOOD M.N.

Effect of pruning, nitrogen, and scoring on growth and bearing characteristics of young Delicious Apple trees.

Proc. Amr. Soc. Hort. Sci., **82** : 5-10; 1963.

At Wenatchee, Washington, an experiment was designed to study the response of young Delicious Apple trees to scoring when grown at different levels of N and pruning in factorial combination.

1. Tree size (as measured by trunk circumference) was similar for both levels of pruning except in the scoring treatments where trunk growth was greater on the pruned trees.
2. N increased growth. Scoring reduced it.
3. Tree yields were substantially higher on the unpruned trees. This was due to the greater amount of bloom than any difference in fruit set.
4. In most instances scoring increased yield by increasing bloom and fruit set during the year following. However, this gain was off set by lower yields when scoring was discontinued.

441. DAYTON, DANIEL F.

The distribution of Red Colour in the skin of apple varieties of McIntosh Parentage.

Proc. Amr. Soc. Hort. Sci., **82** : 51-55; 1963.

The pattern of colour distribution was examined in the skin of 15 varieties and selections of McIntosh parentage, as well as in 3 red-fruited varieties used in parental combination with McIntosh, and in 57 red fruited seedlings from controlled crosses. In McIntosh very high proportions of the epidermal cells contain red pigment, and this character was also found in almost all of the varieties and seedlings of McIntosh parentage. Most of the parental varieties used in combination with McIntosh have non-pigmented epidermal cells. The evidence indicates a relatively simple dominant genetic mechanism transmitted gametically by McIntosh.

442. HARDENBURG, R.E. AND ANDERSON R.E.

A comparison of polyethylene liners and covers for storage of Golden Delicious apples.

Proc. Amr. Hort. Sci., **82** : 77-82; 1963.

Individual 1.5 mil polyethylene film liners in field boxes or corrugated cartons were more effective than 2-mil polyethylene pallet covers or bulk-box covers in preventing weight loss and shriveling of Golden Delicious apples during storage. Moisture from the pre-cooled fruit under the pallet or bulk-box covers still was lost to the boxes or from the exposed bottom of pallet. However film pallet covers over field boxes prevented serious shriveling and offered the advantages of lower cost than individual box liners plus ease of application after precooling. Pallet covers over corrugated cartons allowed as much weight loss from fruit as without the covers. A polyethylene slip cover placed over corrugated cartons before bidding allowed an intermediate amount of weight loss and shriveling between that occuring with and without box liners. These slip covers were easy to insert or remove.

Fruit shriveling was extensive only in fruit unprotected with film during prolonged storage. Deterioration (splitting followed by decay) under the pallet covers was excessive only when fruit was too mature for late storage.

Gas concentrations under the pallet covers and bulk-box covers ranged from 0.4 to 1.1% CO_2 and 19.4 to 20.7% O_2.

N.B. Pallet Covers were a gussetted style that fit over 24 or 30 boxes. They were open at the bottom so boxes and fruit were exposed to air and dehydration on that side.

443. SERR, E.F. AND JOHN H. FOOTT

Effects of whitewash cover sprays on Persian walnuts in California.

Proc. Am. Soc. Hort. Sci., **82** : 243-49; 1963.

Late spring and summer cover sprays of zinc-lime and 2 proprietary whitewash materials used on Persian walnuts decreased the temperatures at the centers of nuts about 3° F. They decreased the numbers of sun. burned walnuts and the severity of sunburn damage to nuts, leaves, twigs and branches in the south-west quadrant of trees. There was no apparent injury to foliage from the whitewash materials used.

The largest effect on nuts noted in 1961 season was a significant increase in the numbers of nuts in the large, sound classification at harvest. No significant effect on total yield was found.

444. HILL-COTTINGHAM, D.G.

Effect of the time of application of fertilizer nitrogen on the growth, flowering and fruiting of Maiden apple trees grown in sand culture.

Jour. Hort. Sci., **38** (3) : 242-51; July 1963.

Malling II rootstocks were grown throughout 1960 in sand on nutrient culture solutions containing 1, 4 or 10 mg. equivalents of nitrogen as nitrate (referred to as N_4 N_4, N_{10} rootstocks) and during that summer each rootstock was budded with the variety Lord Lambourne. The growth, flowering and fruiting performance of the resultant maiden shoots were recorded from bud break 1961 to fruit set 1962. Throughout the second period each tree was given only a minimum of nitrogen (N_1) except during a certain period of one or two months duration, when it received a simulated fertilizer application (N_{10}).

The greatest amount of primary extension growth in 1961 took place on the maidens given supplementary nitrogen in June on the N_1 and N_1 rootstocks and in July on the N_{40}. Secondary extension growth in 1961 was apparently induced by supplementary nitrogen given to the maidens on the N_4 stocks in July and to those on the N_1 in August.

The highest number of fruit buds and blossoms in 1962 resulted from the June 1961 high nitrogen supplement to the maidens on the N_1 and N_1 stocks and from the July supplement to the N_{10}.

After open pollination, the maidens grown on the N_{10} stocks set fruit better than on these that were more nitrogen-deficient. Among the N_{10} and N_1 maidens, those receiving the September nitrogen supplement gave the highest yield.

These results are discussed especially in relation to apparent differences in quantity and quality of blossoms. It is suggested that the quantity of blossoms is related to the amount of primary extension growth, while the quality is determined by the extent to which reserve CHO and Nitrogen have been accumulated during the previous autumn.

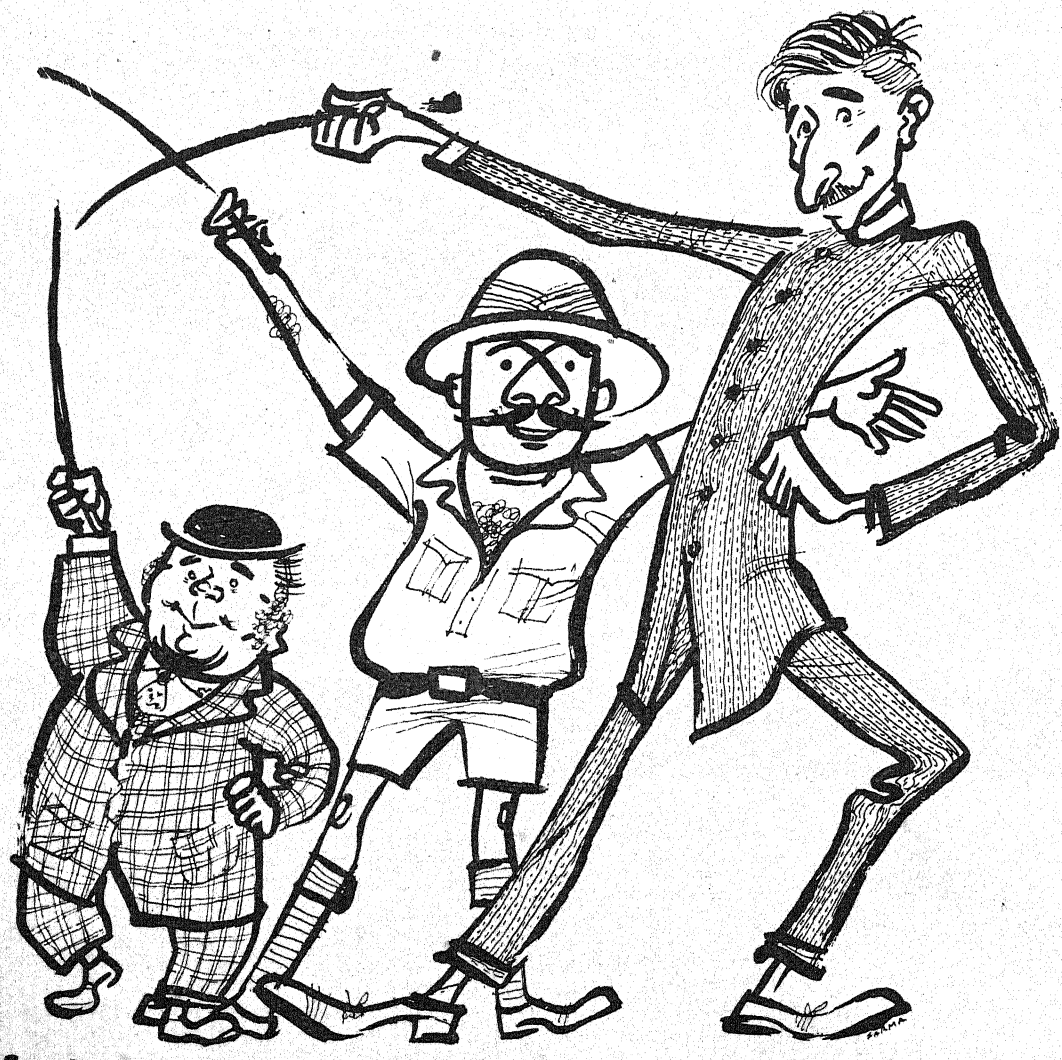
445. SIMS, E.T. JR. AND DONALD COMIN

Evaluation of objective maturity indices for Halehaven Peaches.

Proc. Am. Soc. Hort. Soc., **82** : 125-130; 1963.

Several chemical and physical measurements of Halehaven peaches harvested at 8 stages of maturity were evaluated with the purpose of finding a reliable, quick, and objective measure of maturity. Indices studied were firmness, ground colour, surface colour, flesh colour, flesh reflectance, PH, total titratable acidity, soluble solids-acids ratio, transmission of light through juice, foaming, tendency of juice and index figure.

2. The results indicate that the most accurate indices of maturity under the conditions of this experiment were firmness, ground colour, the soluble solids-acids ratio, total titratable acidity, and flesh colour.
3. A high correlation ("r"=0.972) was found between firmness of the fruit as measured by a Durometer and as measured by the Magness-Tayler pressure tester.



All for one, one for all!

"A solemn and public pledge," *said Tata-Fison.*

"To create!" *said Ralli, thinking of fertilizers.*
"To grow healthy crops—ensure bumper harvests— to feed the hungry millions."

"To destroy!" *thundered Tata-Fison thinking of pesticides.*
"We'll exterminate scurvy pests, villainous insects and strangling weeds."

"In short," *they said together,* "a public pledge to cover the field!"

Tata-Fison and Rallis have combined their separate marketing organisations into a single, unified service. For the future, all Tata-Fison products will be marketed by Rallis' Fertilizer and Pesticides Division. The merger will prove of immense benefit to the Indian farmer. For the first time, one integrated service will provide advice and products covering both crop growth and crop protection throughout the country...a notable contribution to the cause of agricultural progress.

TATA-FISON AND RALLIS
COVER THE FIELD!

TATA-FISON RALLIS

INDEX TO INDIAN HORTICULTURE

Prepared by A.S. SESHAN

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CACTI—Bizarre in appearance, thorns all over, and yet bear beautiful flowers

PHOTO—S.J. SHARMA

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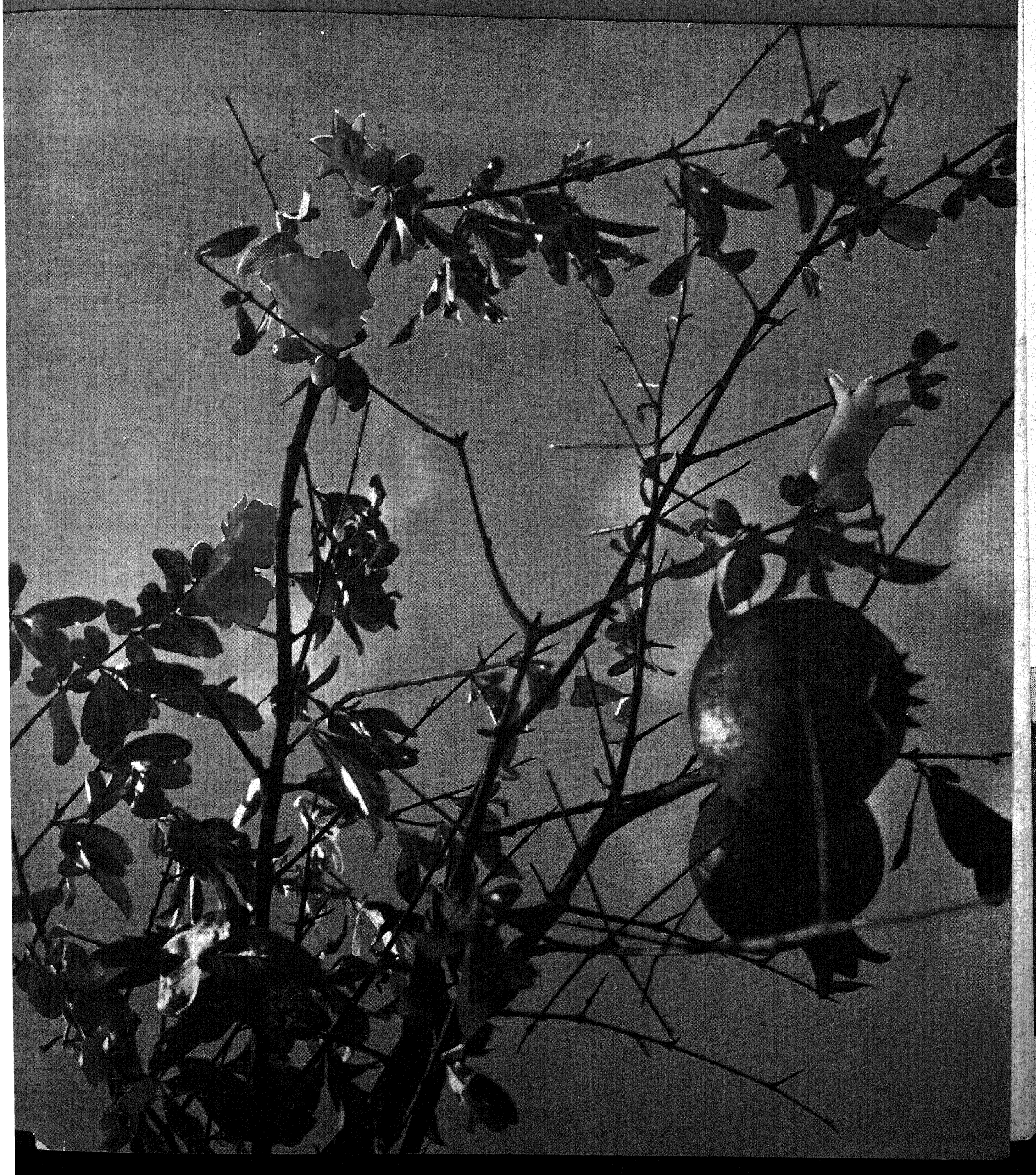

The great banyan tree at the National B
nical gardens. The 180-year-old tre
1,000 ft. in circumference.

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OUR COVER
Pomegranate—A highly nutritous fruit; it has high medicinal value too
Photo: **S.J. Sharma**

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INDIAN COUNCIL OF AGRICULTURAL RESEARCH, NEW DELHI

editor's page

HORTICULTURAL NOMENCLATURE

THE PLANTS are usually known by three types of names, the common name, the botanical name and the cultivar names of forms deliberately raised and maintained in cultivation by man such as Bougainvillea 'Mary Palmer', potato 'King Edward' and rose' Delhi Sunshine'.

While there is already much dissatisfaction among non-specialists about frequent changes in the botanical names of the plants they grow, catalogue and sell, the confusion prevailing in the cultivar or varietal names has made the situation still worse. In India, there is a plethora of synonyms for every species and variety. Many of the nurserymen and orchardists vying to own large collections have been crazily naming every variable seedling as a variety usually associating with it the names of their family members, relatives or patrons. Furthermore, some have coined several family names by acquiring such varieties in their respective regions and giving them new names to sell their grafts. This is the reason why we find in a nurseryman's catalogue many varieties assuming different names. Take for example the mango variety, Langra. It is variously known as Langra Banarasi, Langra Hajipur, Langarhi, Tikari (Farrukhabad), David Ford, Hadialazis, (Bhopal), Langra Faquirwala, Ruheafza, Chapta, etc.

Not only this, the same name is used often for entirely different varieties, for example, Malda of Western U.P. is quite different from the Malda sold in Calcutta markets, and the same is true of the many Safedas grown in different parts of the country. The list of synonyms is further lengthened by the traders who adopt well known varietal names for inferior types to attract customers. There is, therefore, urgent need of standardisation of nomenclature of cultivated horticultural plants in our country.

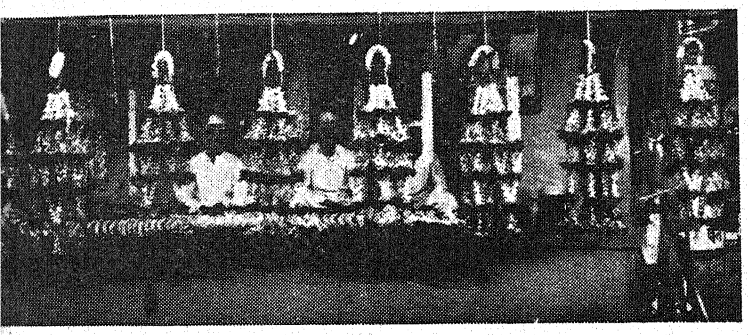
The necessity to establish an organisation to evolve a Code of Indian Horticultural Nomenclature was first discussed at the third Horticultural Research Workers Conference held at Simla in June, 1957 under the aegis of the I.C.A.R., wherein it was decided to evolve a National Code of Horticultural Nomenclature for cultivated horticultural plants on the basis of the International Code of Nomenclature of cultivated plants. The Conference also decided to draw up a National Register of cultivated varieties of horticultural crops on the basis of standardised descriptions. In international sphere a number of registration authorities have already started functioning for all the major groups of horticultural plants, which is an important step towards the stabilization of cultivar names. This should provide an incentive to horticultural scientists in our country to develop the work of horticultural nomenclature and registration at national level. The I.C.A.R. has already started recording all synonyms and detailed descriptions of mango, banana and citrus varieties thus laying the foundation for standardised nomenclature of innumerable varieties of these fruit crops in the country. Work is also being initiated on a National Register of varieties of fruits and nut-crops grown in India. The standardised names of plants with brief economic descriptions will be recorded in the Register in addition to listing their many synonyms. This is undoubtedly a land-mark and a major step towards the stabilisation of names of cultivars. At present work is restricted to only three fruits—mango, banana and citrus; the national register would, therefore, remain incomplete unless it is broad-based so as to include all varieties of fruits, vegetables and ornamental plants. It is quite gratifying to note that the Indian Standards Institution has also taken up the preparation of a list of standardised varietal names with botanical names and Indian synonyms of important horticultural crops. This may help in reducing the confusion to a great extent in the trade of horticultural commodities.

The role of the growers and horticulturists in the Council's plan of evolving standardised nomenclature is not in the least less important. Details of any new variety evolved by horticultural institutions or private growers should be communicated to the Council for inclusion in the National Register. The private growers and nurserymen who in fact represent the producers' interests and nursery trade, it is hoped, will lend full co-operation in the compilation of the Register. The Register when ready would be of immense value in stabilising cultivar names in the country and put the horticultural trade on scientific lines.

FLORICULTURE—A DEVELOPING INDUSTRY IN INDIA

S.L. KATYAL
Indian Council of Agricultural Research

TILL RECENTLY flowers and flowering trees held a back-seat in agricultural development schemes. As their appeal is largely to the eye, it was considered a luxury to invest public money on them and hence floriculture was relegated to minor bodies like Agri-Horticultural Societies, Municipal Committees and Corporations, District Boards, Canal Departments, C.P.W.D., town planners and progressive nurserymen. True, ornamental plants were planted for beautifying roads, parks, public gardens, etc., and ornamental plants and flowers were exhibited at Flower Shows. But on the whole, scant attention was paid to this subject by the State Departments of Agriculture or Horticultural Sections. It was only in 1957 that the Indian Council of Agricultural Research asked States to formulate schemes on the subject and to send them to the Council for consideration. As an incentive, it was decided to meet the expenditure on floricultural schemes up to 100 per cent to commence with.



Gorgeous garlands at a flower shop in Poona

For systematic research work on the important ornamental plants, a co-ordinated scheme was formulated by the Council with 10 centres for research on different ornamental plants in various suitable places in the country. The ornamental plants allotted for research at various centres were: roses, (New Delhi); bougainvillea (Hyderabad); azaleas, camellias, rhododendrons and orchids (Shillong); bougainvillea, hibiscus, and crotons (Bangalore); succulents, cacti, azaleas and camellias (Ootacamund); jasmines, crossandras and chrysanthemum (Coimbatore); marigold, jasmines, roses and chrysanthemum (Saharanpur); orchids (Darjeeling); cannas (Poona); and lotus, water lillies, tuberoses (Calcutta). Some useful work has been done under these scheme at various centres.

At Hyderabad, about 120 varieties of bouganvillea have been collected and grouped under four species, namely, *Bougainvillea glabra*, *B. peruviana*, *B. buttiana*, *B. Spectabilis*. At Coimbatore, a number of varieties of jasmines and crossandras and chrysanthemums have been collected and their morphological descrptions recorded. Observations on blossom biology have been carried out. Trials on vegetative propagation of *Jasmine sambac* using plant regulators and studies on seed viability in crossandra have been initiated and data recorded. At Ootacamund, the collections include eight shades of *Azalea indica*, six shades of *Camellia japonica* and about two hundred varieties and species of cacti and succulents. At Shillong (Assam), a number of azaleas, camellias and *Rhododendron arboreum* and *Rhododendron formosum* plants have been collected, in addition to about 2,600 orchids.

Roses. At the I.A.R.I., New Delhi, about 142 rose varieties under different classes of roses have been introduced from foreign and other sources within the country. Out of five rose varieties evolved by Dr. B.P. Pal, Seedling No. 7 was found to be the most promising and has been named as 'Rose Sharbet'. Rose Sherbet is a seedling from a well-known rose, "Crussan-Teplitz." It bears glowing deep pink flowers and bears profusely. The variety has 0·033 per cent oil content, which is the highest of any of the rose varieties. It has been placed in floribunda group. Seedling No. 20 as climbing rose and seedling No. 24 as floribunda

Profusion of flowers in an aster field near Poona

type have also been found to be very promising. Rambling rose Pink Pearl is a bud short from a bush plant of a polyantha variety and has been released for distribution after final assessment of its performance.

At Saharanpur (Uttar Pradesh), a number of varieties of marigold, jasmine, roses and chrysanthemums have so far been collected.

At Bangalore, (Mysore), intensive work on selection of new and improved varieties of bougainvillea and hibiscus has been done. The four mutants, namely *B. Thimma, B. Rao, B. Laxminarayana* and *B. Sharma* are promising and have been multiplied in large numbers. They possess extremely beautiful flowers. Some outstanding varieties of hibiscus have been introduced from Hawaii and are doing very well. Work on collection of crotons is also in progress there.

IMPORTED ANNUALS

Under the co-ordinated scheme for maintenance and propagation of seeds and bulbs of imported ornamental plants, extensive work has been done at the three centres: Mashobra (H.P.) Ootacamund (Madras) and Mussoorie (U.P.). At Mashobra, a collection of 205 different varieties of annuals and 10 bulbuous plants have been built up. This comprises of 49 varieties of gladioli, 79 of dahlia, 30 of double gerbera, 35 of amaryllis, 6 of tuberose begonia, 3 of cyclamen and one each of haementhus, hyacinthus, tigridia and eucharus. Exotic varieties of hydrangea, fuchasia and geranium numbering 50 have been recorded and described. At Ootacamund (Madras), different shades of annuals like cineraria, violet, phlox, poppy, petunia, balsam, pansy, antirrhinum and bulbous plants like anemone, agapanthus iris, gladiolus, cyclamen lilium, etc., have been collected and are under study. At Mussoorie (U.P.), seeds of a number of varieties of petunia double, pansy giant and asters have been imported from abroad for acclimatisation. The local collection of the seeds of godetia, lupin, hollyhock and schizanthus was made. The bulbs of anemones, eucharis, gladioli and dahlia have been introduced and are being propagated.

CYTOGENETICAL STUDIES

Under the scheme for cytogenetical and physiological studies at the I.A.R.I., New Delhi, colchicine induced polyploids of a number of winter annuals have been tested in advanced generations for the stability of their chromosome numbers and for their phenotypic character and fertility. The tetraploids of antirrhinum have been found to be consistently superior to diploids. The tetraploids of larkspur and marigold appeared highly satisfactory. An interesting double mutant of cosmos has been described. The double and tabular mutants of annual chrysanthemum have been purified to a considerable extent.

Under the scheme for laying out Japanese-type gardens in different suitable places in the country, 24 sites were selected in different States and their detailed layout plans prepared. Extensive work has been done at Roshanara Gardens, Delhi to develop it into a Japanese style garden.

Under the scheme on the survey of assessment of possibilities of the cut-flowers business, visits to five ower markets, i.e., Bombay, Calcutta, Delhi, Madras and Bangalore revealed an annual turnover of Rs. 926 lakh worth of cut-flowers, like rose, jasmine, marigold, chrysanthemum, lilies, gladioli and asters, weighing 10,460 tons and grown in an estimated area of 7,465 acres.

FINANCIAL ASSISTANCE

Financial assistance is given to the Agri-Horticultural Societies to help them to arrange flower shows, bringing out publications, purchase of books for members, arranging training courses, etc. There is also a scheme for providing financial assistance to outstanding nurseries for preservation of rare collections of plants by construction of glass-houses, green-houses, and improving other facilities of the nursery. Many of the societies and nurserymen have taken advantage of these schemes.

Schemes to improve the local varieties of annual flowers through hybridisation and selection and to survey the pests and diseases attacking the ornamental plants are also being taken up. Although work in floriculture in this country is of recent origin, substantial results have been achieved and more are anticipated within a few years. It is hoped that lot of information on the scientific cultivation of ornamental plants and flowers will be available, besides evolution of the new and improved varieties. Ultimately it is desired to propagate improved varieties of flowers in the country and find markets for export purposes to neighbouring countries.

NOT SO GREEN A BUYER

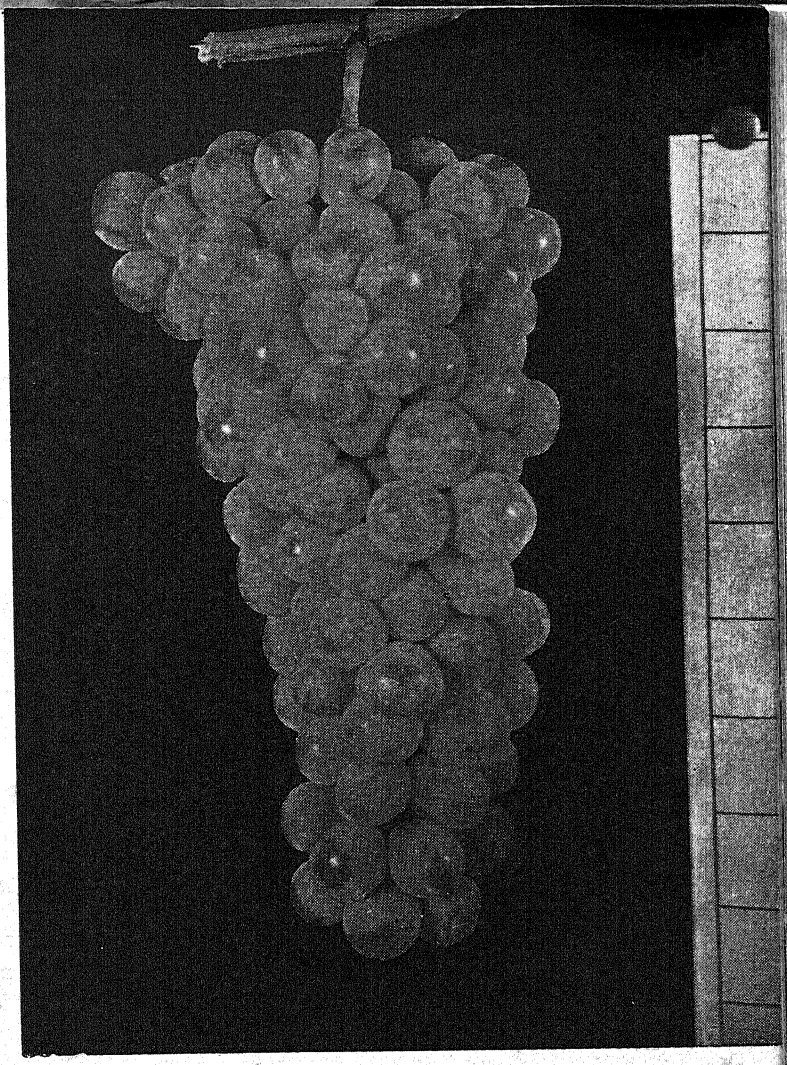
A boy walked into a farmer's melon patch and asked the price of a fine big melon.

"That's 80 *N.P." said the farmer.*

"I have only 18 *N.P." the boy told him.*

"Well," smiled the farmer and winked at his wife as he pointed to a very small green melon, "How about that one?"

"Fine. I will take it," the boy said, "but don't cut it off the vine yet. I'll call for it in a week or so."



BHOKRI—This variety, till recently, had been the ruling commercial variety of our country.

grape culture

means rich food, better returns

L. VENKATARATNAM
Dy. Dir. of Agriculture, Directorate of Agriculture, Hyderabad

Grape culture does not only give pleasure but also brings good returns. It has paid greater dividends to some enthusiastic growers in South India, than any other type of farming or farm enterprise. The unique success attained in grape culture in Andhra Pradesh and other parts of South India has attracted much attention of growers, industrialists and businessmen in our country. The first wine factory venture is just under creation in Bangalore where the area under grape has exceeded 5,000 acres. Grape culture at this juncture can help us to reduce our dependence on imports of wine from foreign countries. It can give us nutritious raisins and provide us with rich food. Grape juice is a delicious soft drink which can in due course replace synthetic drinks. One who thinks of grape culture would naturally like to know the secret behind successful grape culture and the origin of this romantic fruit.

At present, grape occupies over 25 million acres and most of this is converted into wine or raisins and only a fraction of the crop is used fresh as dessert grapes.

ROLE OF CLIMATE

This vast acreage of grape in the world is restricted mostly to temperate regions which are characterised by dry climate with very low annual rainfall not exceeding 250 mm. The best yields are obtained in dry regions wherever they may be. Almost all the principal varieties under cultivation belong to the group *Vitis vinifera*. These are susceptible to fungus diseases, and their introduction in humid areas in Kerala, Assam and Bengal, is foredoomed to failure. Home gardeners can try the hardy *Vitis labrusca*, popularly named as Bangalore Blue, in these regions with some degree of success. The production of choice dessert and wine grapes is naturally the gift of low rainfall tracts. Rajasthan, Punjab, can, therefore train farmers and embark on large-scale viticulture. Some of the principal districts where the soil is highly porous, free from salinity and waterlogging, offer great scope for this venture. In North India, due to the prevalence of severe winter till the end of January, new growth emerges in grape from the beginning of February. Consequently the crop reaches maturity after 120 to 150 days in July or later. Caught by the monsoons in the months of July and August, the grape crop suffers extensive damage, resulting in loss of quality, shattering, berry cracking and uneven ripening. No wonder that commercial viticulture is restricted to South India where such problems do not exist.

PERLETTE: AN EARLY VARIETY

Horticulturists in California have succeeded in evolving an early variety of seedless grape called Perlette. (See *Ind. Hort.* July-Sept. 1963) This variety has already shown signs of promise at the Agricultural College and Research Institute, Gwalior and may one day become the ruling variety of North India. There is one drawback in this variety that the berries are densely crowded, forming compact bunches, and do not attract the buyers, though fairly rich in sugars, with 16-18% brix value. Gibberellic acid, the new revolutionary growth regulator, may help to arrest these undesirable qualities in perlette and give us loose, big-sized, sweet and seedless grapes.

TWO CROPS A YEAR IN SOUTH INDIA

While in most of the grape regions, growers reap a single harvest, mainly in the months between July and September, South India has the unique and unparalleled experience of reaping two harvests a year.

This is due to lack of distinct winter in South. In the tiny hamlet of Pattiveeranpatti in Madurai district, two crops of grape are taken, one in May and another in November in varieties like *Gulabi* and *Bhokri*. In and around Bangalore, growers prune Bangalore Blue almost round the year and ship the produce to even far off markets in North India. This unique venture of obtaining continuous harvest of grape round the year has not been attempted with such success in any other part of the world. The Deccan Plateau, comprising the central region and parts of Rayalaseema with their low rainfall and lack of distinct winter, is most ideally suited for securing bumper harvests of grape.

Grape yields average between 10 to 12,000 kg. and many growers are able to secure a decent profit ranging between 5,000 to 6,000 rupees. The present rate of expansion may result in gluts and growers may have to sell their grapes at distress prices for want of proper markets. Cold storage, marketing co-operatives and speedy transport facilities may help ease the problem.

CHOOSE RIGHT VARIETY

The vast varieties of grape number over 5,000. These varieties have been classified as Dessert, Seeded, Seedless, Raisigs, Wine and Juice varieties based on the purpose for which they are used. Besides these, they differ in their nodal habit especially in producing flower clusters and are ranked as Short, Medium and Long spurred varieties. Based on the time of harvest, they are grouped as Early, Mid-season and Late-ripening qualities. Among these, the variety Thompson Seedless is the one widely grown in most countries due to its seedlessness and high sugar content ranging between 20 to 24 brix. This is imported mostly from Baluchistan to Delhi and other principal markets in India in August-September. Because of its utility for dessert, for raisins and wine production, it occupies the largest area in the temperate regions of the world. Unfortunately attempts to secure heavy crops in the plains of South India have not been encouraging, as it lacks a distinct winter.

ANAB-E-SHAHI. The next in rank is the *Anab-e-Shahi* grape of Hyderabad. The bunches are attractive and alluring ones, weighing 1-2 kg. with berries bigger than the size of marbles. Yields ranging between 15,000 to 20,000 kg. have been recorded by a few growers. This variety is unsurpassed for its yield, vigour and external appearance, and ranks as the best in India. Its sugar content has not gone beyond 14-16 brix and further research is needed to increase its sugar, so that, it may enter world market and face successfully international competition.

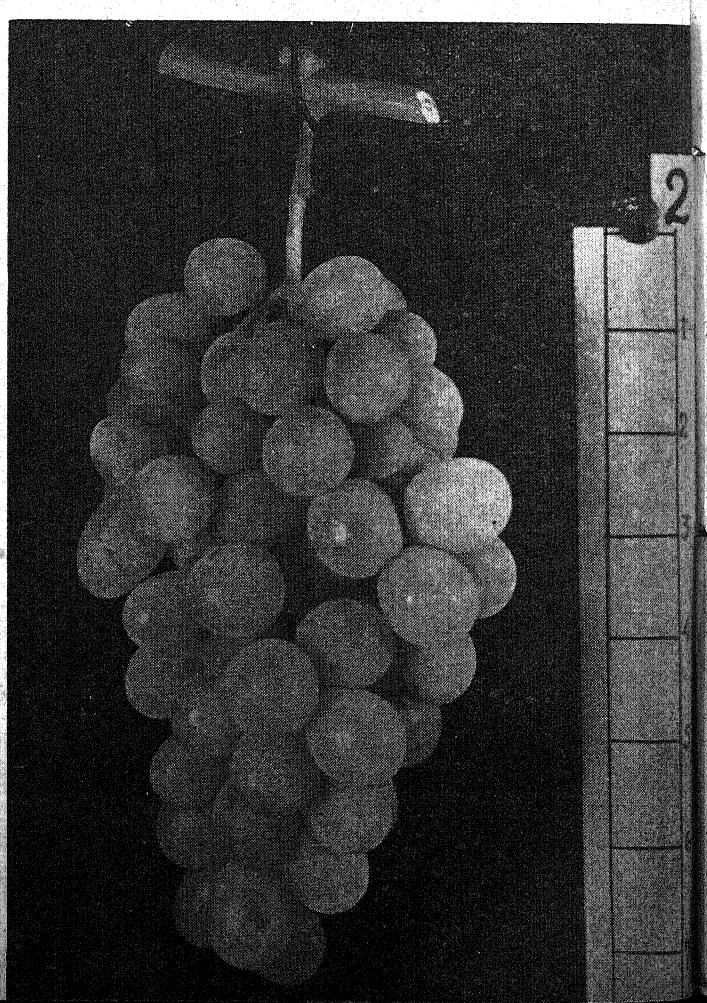
SELECTION 7. Bred, two decades ago by Dr. Cheema, at Ganeshkind Botanical Gardens, Poona, Selection 7 has recently shown its great potentiality as a keen rival to *Anab-e-Shahi*. It has most of the desirable characters of *Anab-e-Shahi* in vigour, yield, and surpasses in quality with sugar content between 18-20 brix. The chief drawback of this variety is the presence of smaller berries in dense and compact bunches which do not get such premium price in the market as *Anab-e-Shahi*. In a few years time, with further research on and use of gibberellic acid, this may be overcome, and this variety may one day become the leading dessert grape of India.

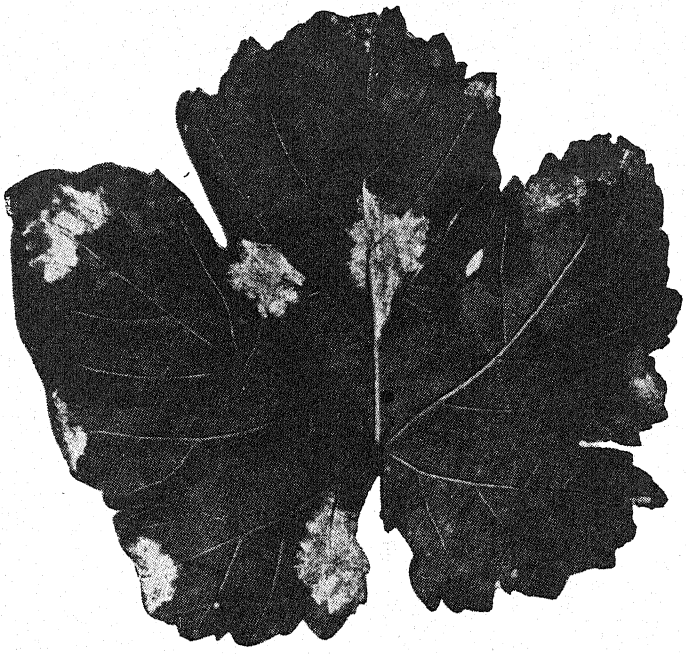
BANGALORE BLUE. Bangalore Blue is an excellent juice and wine variety and excels all varieties in hardiness and resistance to diseases. It is cultivated extensively in and around Bangalore.

This variety may in course of time lose its market as a dessert grape and ultimately take its place for juice and wine production.

OTHER VARIETIES If one is eager to grow around cities, purely for juice, *gulabi* is unmatched for its heavy yield, prolific bearing and fair degree of hardiness. In Madurai district, the area under this variety is fast spreading replacing *Bhokri*, which till recently had been the ruling commercial variety of our country. Growers have realised the futility of adhering to very poor quality *Bhokri* and are abandoning its cultivation. *Bhokri's* sub-acid character and

The leading grape variety—Anab-e-Shahi of Hyderabad





The lower side of a grape leaf affected by downy mildew

tart skin render its heavy yield unappealing. Just as *Bhokri* is replaced by other varieties, growers in North can think of perlette and Thompson seedless for replacing *Khalili*, *Dakh* and other varieities.

TRAINING OF GRAPE VINES

Grape is a creeper and therefore needs support and proper training. Any variety of grape under our conditions should be so trained as to produce one fruiting cane per square foot area. Judged on this basic concept, the erstwhile system of training on single stake, vertically on posts in two or four horizontally parallel arms called Kniffin system, or on modified Munson or Telegraph system with 'T' shaped posts, cannot assure such perfect layout for the grape foliage. Growers horticulturists and other workers in the field differ violently on the concept of training grapes and it has almost become a fashion for every individual to train the grapes in any manner he likes. The overhead bower system no doubt entails initial investment of about 6,000 to 8,000 rupees. But this system has proved to be the best in Andhra Pradesh, Madras and Mysore States and is gaining favour with growers in Maharashtra, who for decades were accustomed to single stake and Kniffin systems. Essentially, the bower system consists of planting cement or stone posts at 12 to 15 feet distance either way in raising a bower by running G.I. wire at 12"-18" distance on wooden posts or angle iron bars fixed horizontally at 7 to 8 feet height.

The greatest drawback in viticulture is the initial investment of establishing a vineyard on bower system. The Indian Council of Agricultural Research has come out with a project to assist the establishment of orchards in the country, and grape orchards have now been provided preferential treatment with a loan of Rs. 3,000/- per acre towards meeting initial investment costs.

PRUNING PROBLEM

The grape unlike other fruits would not fruit unless it is pruned in the proper season and trained in the right way. Every shoot coming from the grape is a potential fruit bearer and the new growth should be regulated as to grow in stages and spread equally on all sides at a uniform rate. This regulation ends in what are known as 'canes' or well developed pencil-thick shoots. Only these are pruned to 2-7 leaves or buds depending on the variety. In summer, starting from early February in North to June in the South, the grape is pruned generally for promoting new growth and for reducing fruiting canes. Again this is pruned between October and December for producing crop, retaining only 3-7 buds on each cane developed from summer pruning or foundation pruning as it is more often called. No pruning is done in North India during winter as the grape leaves turn pruple and shed away remaining dormant and apparently lifeless. Any attempt to prune the grape during severe winter months will cause 'bleeding' or what is called exudation or vital fluid sap. This may weaken new growth that starts from February. Hence, in areas with severe winter, pruning by the end or January or beginning of February is desirable.

PROTECTIVE MEASURES

Grape is susceptible to several insect pests like beetles, thrips, aphids, mites, borers, white ants and honey bees. The ravages of diseases like 'mildew' and black eye spot 'anthracnose' are so widespread that these may effect complete loss of crop. A rigid schedule of plant protection with suitable insecticides like DDT, Endrin, Malathion, Parathion and pesticides like Bordeaux mixture, Diathane, Ultra sulphur etc., will be vitally necessary. Successful grape growers are those who manure the crop with heavy doses of green leaf, oilcakes like castor, or *neem*, with suitable ratios of superphosphate and potash and protect the crop against pests and diseases. Vigilance is the watchword in viticulture and any negligence may mean ruin to the entire effort of the whole year. In fact the deterrent calamities by fungus diseases like anthracnose and mildew faced by several growers have detracted many persons from taking to grape culture.

The enterprising growers with sound training can embark on grape growing. Grape growing can bring us more foreign exchange from an acre of land than any other agricultural crop. Grape juice can replace all synthetic drinks and provide nutrition, and fermented and distilled wine can secure us wealth from abroad. The unique natural facilities that exist in several parts of our country are yet to be exploited by the State Governments and private enterprise.

SOME TIPS ON TERRACE GARDENING

PREM NATH AND P.M. BHAGCHANDANI
Indian Agricultural Research Institute, New Delhi

With the growing awareness of the food value of vegetables and their prices souring high, more and more people in the towns are taking to terrace gardening. Terraces have been used in other countries as well as in our country for flower gardening but there is tremendous scope for vegetables too. This may not meet the entire need of a family, but it would help to a great extent in our present day of food scarcity.

HOW TO BEGIN

It is not always necessary to have some special type of roof or terrace. Any building with concrete roof will serve the purpose. However, the roof or terrace must be strong enough to hold the weight of soil and plant. The open terrace on the second or the third floor will be quite suitable. Some people construct their buildings with a terrace specially made for gardening.

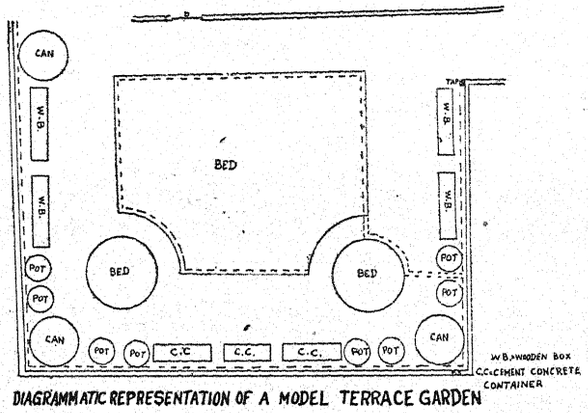
Open roofs are sometimes utilized as small vegetable beds by bordering with planks or bricks, and it might work out if the cement is painted with waterproof paint but there is danger of seepage spots. The area of a bed will depend on the availability of space. However, it is advisable to have small plots of about 2.5 sq. meter each which would facilitate handling. The depth of soil would range from 30 cm. to 60 cm. depending on the type of crop to be raised in it. Green leafy vegetables like *palak*, *kulfa*, lettuce, *dhania* etc., will require lesser depth of soil than root crops like radish, carrot, etc.

If the terrace itself is not suitable for making a vegetable bed, the spot could be utilized by putting commercial concrete containers of about 91 × 61 cm. size but of different depths depending on the type of vegetable to be raised. Often, these costly and permanent containers are replaced by cheap and temporary common wooden boxes (76 × 46 cm.). These portable boxes with handles can be made 30 to 60 cm. deep, and they are suited for green leafy vegetables as well as for root crops. These wooden boxes should have legs or two small wooden planks at the bottom to avoid any contact with the floor. Two holes each covered with a concave piece of broken pot will allow proper drainage to excess water. Planned sowings in each box at regular intervals will help extend the supply of vegetables over a longer period of time.

When other things are not readily available, a roof can be utilized by placing ordinary pots (35-40 cm.) which are relatively cheaper and easy to handle. It should contain at least one hole at the bottom for drainage and the hole should be covered. Crops like cluster beans, tomatoes, cowpea (bush type) do well individually in pots. Peas like Early Giant could be staked in pots. Ordinary chemical cans, old oil drums cut into half can also be used.

PLANNING AND PREPARATION

Silt and clay loam soils are recommended for a varetiy of vegetables. A good soil for vegetable can be worked with hand when it is moist. Heavy type of soil can also be made use of if an adequate amount of sand is added to it but the soils containing remnants of bricks and lime which are usually found near the construction sites are unsuitable for vegetable growing. Sometimes, plants are grown without soil in specially prepared nutrient solutions but the resources are rare and one needs a technical knowledge in the preparation, and maintenance of solutions.



DIAGRAMMATIC REPRESENTATION OF A MODEL TERRACE GARDEN

It is worthwhile to prepare a rough layout on a sheet of paper indicating the measurement of the area available for terrace gardening and the area utilised by beds, boxes and pots. If it is a bed on the waterproof floor, the area should be divided into small plots of about 2.5 sq. meters. After giving a border of planks

or bricks with few drainage holes, the area should be filled up with the recommended type of soil about 30 to 60 cm. deep. Farmyard manure or compost is always preferred for vegetable crops. It should be powdered and spread over uniformly. For a plot of 2.4 sq. meter, a basket of manure will do. The manure should be mixed with soil and the clods should be crushed. After a week or so, the soil should be dug up with a digging fork and should be pulverized thoroughly. This is done before the onset of rains. The same soil may also be used for boxes and pots. The recommended soil mixture for pot is the equal proportion of loamy soil and leaf mould. Before filling in the soil mixture into a clean pot, drainage holes should be covered as indicated earlier. New pots must be soaked in water before use.

PLANTING

Usually the seeds of crops like green leafy vegetables and root crops are sown direct in the field but the seeds of crops like tomato, onion, chillies, brinjal are sown first in a specially made seed bed and then small seedlings are transplanted into the bed, box or pot. For terrace gardening, seedlings for transplanting could be raised in ordinary, circular, shallow seed pans. These pans should contain a soil of fine tilth. A good quantity of sieved farmyard manure should be added to it.

Seeds should be sown in line, and small seeds of spinach, carrot etc., should not be sown deeper than ½ cm. whereas seeds of peas, bean, *bhindi* may be planted to a depth of 2 cm. After sowing, seeds should be covered with a thin layer of soil and should be watered gently with watering can. Too much of watering should be avoided.

An erect and strong seedling with three to four leaves is ready for transplantation. The seed bed should be watered before lifting the seedling and care must be taken to see that the roots are not damaged while lifting with a hand shovel. Holes should be made with a rod at uniform spacing and after putting one seedling in each hole the soil around the root should be pressed and watered gently with the *rose* of a water can. The seedlings should be provided with shade for a few days if it is hot weather.

FEEDING THE PLANT

Since vegetable is a heavy feeding type of crop, its nutritional requirements are to be fulfilled very regularly for normal growth and vigour of plant. In these types of beds or containers, the nutrients soon get exhausted and need to be replaced very often. After taking three crops from the same soil, it should be checked whether change of the soil itself is needed. Manures like farmyard manure, compost, leaf-mould, etc., are beneficial and should be topdressed at the rate of ½ basket per 2.5 sq. meter area. The finer the manure, the more easily it mixes with the soil and becomes available to the plants. Liquid fertilizers are quick in effect but one has to be careful regarding the time of application, and type, amount and concentration of the fertilizer. One handful of ammonium sulphate in two gallons of water will top-dress about 10 cu. meters of soil. Depending on the condition of the crop it should be applied at about 10 days interval.

The site should be close to a source of irrigation. If adequate water supply is ensured, variety of green leafy vegetables can be grown even in summer. A levelled area with gentle slope always ensures drainage of excess water.

The selected spot for terrace gardening should have enough of sunlight required by the plant. Hoeing should be done when necessary to aerate the soil and to remove weeds.

SELECTING THE PLANT

While selecting vegetable crops for terrace gardening it is advisable to take shallow rooted crops such as coriander, *methi*, *palak*, *kulfa*, lettuce, mint, tomato and onion. It is good to have quick growing crops like green leafy vegetables.

European radish varieties such as Red Round and White Icicle are quick growing and short-rooted, and hence preferred to Asiatic varieties which have longer roots and need deeper soil. In turnips, flat rooted Early Milan Red Top is preferred to other varieties because

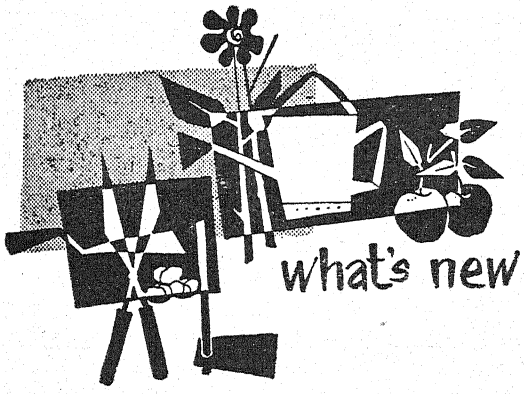
it gives good roots even in very close spacing in the bed. In case of lettuce, it is advisable to take leafy types like Slobolt and Chinse Yellow rather than head types like Great Lake and Imperial 859, which need good spacing and require to be cut once only. *Pusa Phalguni*, a cowpea variety, is recommended because of its nice bushy growth in pots. Similarly, cluster beans may be preferred to the vine type beans. Pusa Red Plum variety of tomato does very well in pots.

It is not advisable to grow the cucurbit crops as they require more spacing and greater depth of soil. On the same ground cabbage, cauliflower, sweet potatoes, potatoes etc., are not recommended for terrace gardening.

PLANTING TIME

A CROPPING PLAN FOR DELHI CONDITIONS

Crop	*Varieties*	*Planting methods*	*Seed rate in gms./10 sq. metres*	*Spacing in bed (cm.) Row to row. Plant to Plant.*
		January-February		
Radish	Red Round, White Icicle	Sowing	14.0	15×7.5
Chillies	—	,,	3.5	in seed pan
Brinjal	Pusa Purple Long	,,	3.5	,,
Onion	Pusa Red	Transplanting	—	15×10
Tomato	Pusa red plum, Pusa ruby, Sioux	,,	—	60×40 or in pot
		February-March		
Chillies	—	Transplanting	—	30×15
Brinjal	Pusa purple long	,,	—	45×45 or in pot
Portulaca	*Kulfa*	Sowing	14.0	15×2.5
Cowpea	Pusa *Phalguni*	Sowing	14.0	in pot
Cluster beans	—	Sowing	14.0	23×7.5 or in pot
Bhindi	Pusa *Makhmali* Pusa *Sawani*	Sowing	7.0	30×15 or in pot
Mint	*Pudina*	Vegetative part		In pot or in box
		April		
Amaranthus	*Chulai*	Sowing	25.0	15×2.5
		May		
Chillies	—	Sowing	3.5	In seed pan
		June-July		
Tomato	Pusa red plum, Pusa ruby	Sowing	3.0	In seed pan
Cluster beans		,,	14.0	23×7.5 or in pot
Chillies	—	Transplanting	—	39×15
		August		
Tomato	Pusa red plum, Pusa ruby	Transplanting	—	60×30 or in pot
		September		
Bell pepper	Simla *Mirch*	Sowing	3.5	In seed pan
Knol khol	White Vienna	Sowing	2.8	,,
		October-November		
Onion	Pusa red	Sowing	28.0	In seed pan
Lettuce	Chinese yellow, Slobolt	,,	14.0	30×30 or in box
Radish	Red round, White Icicle	Sowing	14.0	15×7.5 or in box
Turnip	Early Milan Red Top	,,	14.0	30×15 or in box
Beet	Crimson Globe	Sowing	25.0	30×15 or in box
Spinach	*Palak*	,,	14.0	15×2.5 ,,
Coriander		,,	3.5	22×7.5 ,,
Methi	Pusa early bunching, *Kasuri*	,,	4.5	22×5.0 ,,
Carrot	Nantes, *Desi*	,,	14.0	22×0.5
Peas	Early Giant, Early Badger	,,	100.0	30×70 or in pot
Bell pepper	(Simla) *Mirch*	Transplanting	—	45×30
Knol Khol	White Vienna	,,	—	45×22
Garlic	—	Cloves	—	15×10
		December		
Radish	Red round, White Icicle	Sowing	14.0	15×7.5
Tomato	Pusa red plum—Pusa ruby, Sioux	,,	2.8	In seed pan
Mint	*Pudina*	Vegetative part		In pot or in box



what's new in horticulture

A New Defrosting Machine

A new type of oil-burning defrosting apparatus has been developed which is able to prevent frost damage to a variety of crops at ambient temperatures as low as 26.6° F. The equipment is powered by a 4.42 litre, four cylinder, direct-injection diesel engine.

The apparatus consists of a six-metre trellis mast supporting a special oil burner fitted with fans to blow heated air towards the ground over an area up to 110 yards from the mast. The makers say that with only slight adjustment, the equipment can be converted for pest control and fertilization use as well as for drizzling and spraying crops.

Hybrid Insects to Kill Pests in Orchard

Tiny insects hardly distinguishable to the naked eye have helped Kirghiz sylviculturists to increase substantially the harvest of wild apples. These apples are very rich in vitamins. The apple moth, the ruthless destroyer of fruit trees in mountains, was successfully tackled by the so-called *Ichneumon ageniaspis*, which preyed on the pest.

Ichneumon ageniaspis is a hybrid of the beneficial insects and is excellently adapted for the dry mountain climate. This is a new biological method of combating apple moth evolved by Kirghiz scientists.

The scientists believe that this method can be applied in the mountain forests of Czechoslovakia, Hungary, Rumania, North Italy, and France.

Apple Shape Investigated

The famous Horticulturist, Dr M.N. Westwood, with the cooperation of Oregon State University, is conducting investigations to find out what causes apples to be flat or more "pumpkin-shaped" than others. It has been reported that the shape of apples does not influence quality, but consumers have shown preference for elongated fruit.

In general, where climate is constant, fruit length parallels that of tree growth, Dr. Westwood has found, as the same growth mechanisms work in both stems and fruits. When tree shoots are short, apples tend to be shorter than those on long shoots. This results in differences in shape among apples on the same tree.

According to Dr. Westwood, other factors besides position are at work in determining the final shape of the apple. Growth hormones and climate are two keys to shape which he is examining.

Nutrient Pills

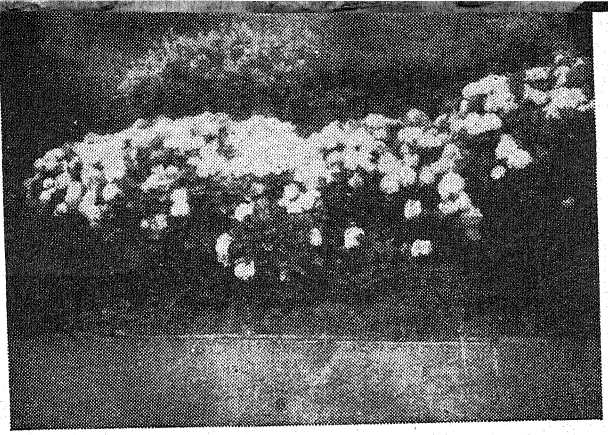
Mr. Victor Vath, a strawberry expert at the South Coast Field Station of the University of California, suggests that South California strawberry growers may increase their yield by using new slow-release plant pills.

Mr. Vath found out in an experiment last year that slow-release capsules containing various fertilizers consistently out-yielded conventional fertilizer treatments in early winter plantings, with only one application before planting. Besides this, berry plants grown with coated fertilizers produced larger and better appearing fruit.

Virus-free trees for propagation

Fruit growers will probably have heard of the East Malling mother tree scheme whereby nurserymen are supplied with virus-free trees which can be used for propagation. The trees are produced at the East Malling experimental horticulture station in the fruit growing areas of Kent by a process which depends on selection, heat treatment, and other factors. The release of mother trees to nurserymen began with the issuing of four cherry varieties in the 1952-53 season, since when apples, pears and plums have also been issued. As a result, most varieties of pome (apple-type) and stone fruits grown commercially in Britain are now available, even though the numbers may be restricted.

It was stated shortly after the first mother trees were released that their freedom from virus would be checked periodically, although it was thought they would remain healthy for many years. The results of these first checks (on cherry mother trees issued between 1953 and 1959) have been published, and show that of a total of 163 trees tested, only ten had become infected —three with the soil-borne leaf roll virus, seven with viruses of the tatter-leaf group. These are known to spread in orchards, and occur in nearly all nursery stock propagated from orchard trees as opposed to those propagated by special methods at East Malling. (Tatter-leaf diseases are thought to be spread mainly or entirely by pollen, so that plantings of virus-free stock away from older orchards should in any case remain healthy for many years.)



Hydrangea flowers in profusion

THE HARDY HYDRANGEA

A Showy Shrub of the Hills

V. LAKSHMANAN
Agricultural College and Research Institute, Coimbatore

HYDRANGEA is an ornamental shrub known for its gorgeous display of blue flower heads in profusion, and is a familiar sight arresting the attention of visitors to the Nilgiris during the summer months of April-May. For the abundance of blooming habit and the variety of shades of white, pink and blue represented in this flowering shrub, one may be tempted to call it the Ixora of the hills. There is probably no shrub so showy and certainly very few that last so long in bloom on the hills. For mass effect on a grand-scale, Hydrangeas are unsurpassable and are well adapted for borders of shrubberies. For indoor decoration, pot plants of Hydrangeas in bloom as well as the flower head or the corymb can be used. The latter lasts for several days as a cut flower. On the plant, the flower heads dry off, turn into an attractive bronze colour and are prized as 'Everlasting' for indoor decoration during winter. Pale blue, dark rich blue, purple, red, crimson, pink, pure white, creamy yellow are the colours in which Hydrangea is available to the gardeners.

The word "Hydrangea" is derived from the Greek work hydor (water) and refers to the water-loving nature of the plant and its cup-shaped fruit (aggeion-a vessel). The popular garden varieties with their large rounded heads of sterile flowers, are classed under Hydrangea *macrophylla* (*Syn. H. hortensis*). Bartram mentions that there are about 500 named varieties and ninety species in the world. The Hydrangeas are mostly low shrubs, with medium sized or large leaves and small white, bluish or pinkish flowers in corymbs or panicles bearing usually marginal sterile flowers with enlarged showy sepals. In some varieties, all the flowers are sterile and enlarged. They are typically temperate, thriving at 60°F. but they tolerate higher temperatures too. Though stray flowering has been noticed on plants kept in shade in Coimbatore and though the performance of this ornamental plant is reported to be fair in Bangalore, the Hydrangea is at its best on the Nilgiris above elevations of 5,000 ft. They usually need a rich, moist, loamy soil and do best in acid, lime-free soil, with a pH range of 4.50 and 5.00. They revel in moist places and many varieties will flourish with their roots partly submerged in water especially during the hot months when they are full of flowers.

PROPAGATION

Propagation is done by stem cuttings. Cuttings 10"-12" long are cleanly cut with a sharp knife from the top of unflowered shoots in September-October and inserted in a lime-free medium of open texture. Semi-hardwood cuttings root easily and produce leaves within six weeks and become ready for transplanting in about 18 to 20 weeks.

SELECTION OF COLOUR

It is not difficult to grow Hydrangea. For successful and vigorous growth, a mixture containing one part garden loam, one part sifted leaf mould, and the third part of equal proportion of coarse sand and powdered cattle manure may be used. White, pink and blue varieties are commonly met with on the Nilgiris. Plants grown in acid medium produce intensive blue colour in flowers. The more acid it is, the more blue will be the colour. If the soil is not acidic enough, the flowers will be mauve or purple in colour. Blue flowers can also be obtained in a pink variety, by adding aluminium sulphate, (about 1 oz. to 1 gallon of water) to the soil every two weeks starting in late January. White varieties do not react to any colour treatment.

MANURING

The soil should be forked carefully in January without disturbing the roots near the surface and the plant is fed with a mulch of freshly gathered and half-rotted leaf mould. Leaves of Oak trees (*Quercus* sp.) are found to have very good effect as a compost for the Hydrangea on the Nilgiris. When flower buds begin to form in February or March, the plant should be supplied with

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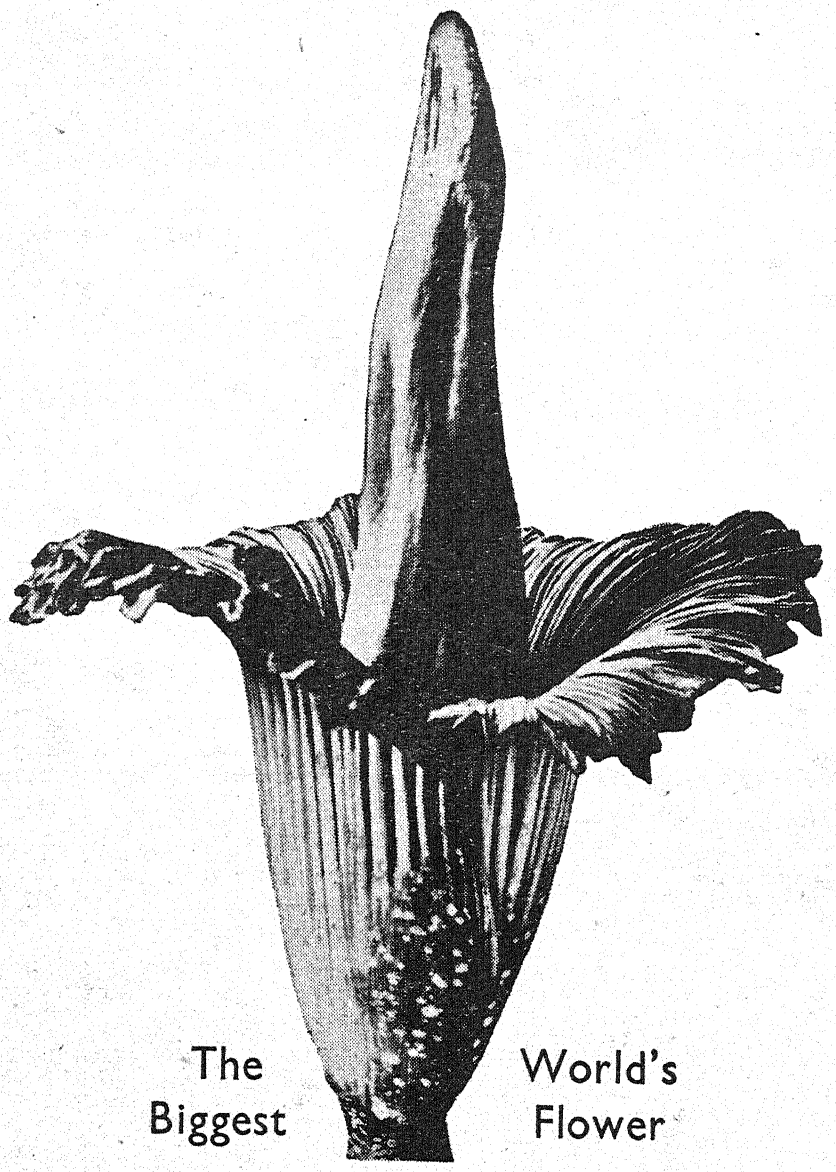


The World's Biggest Flower

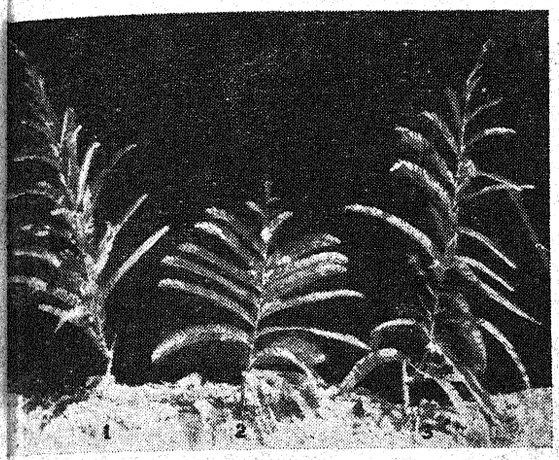
Amorphophallus titanum Beccari is considered to be one of the most remarkable plants known in the world for its gigantic stature in every respect. It is a unique tuberous plant with the tuber itself measuring 5 feet in circumference and a leaf stalk of 10 feet, not to talk of the leaf blade which at times measures 45 feet in circumference. The flowers which are dark chocolate in colour appear on 6 feet long spadix covered with a sheath, 3 feet in diameter. No wonder it is considered one of the world's biggest flowers. Blooms were noticed in the Kew Gardens in 1890 for the first time.

These are natives of the Old World, Australia, Sumatra and other Pacific Islands.

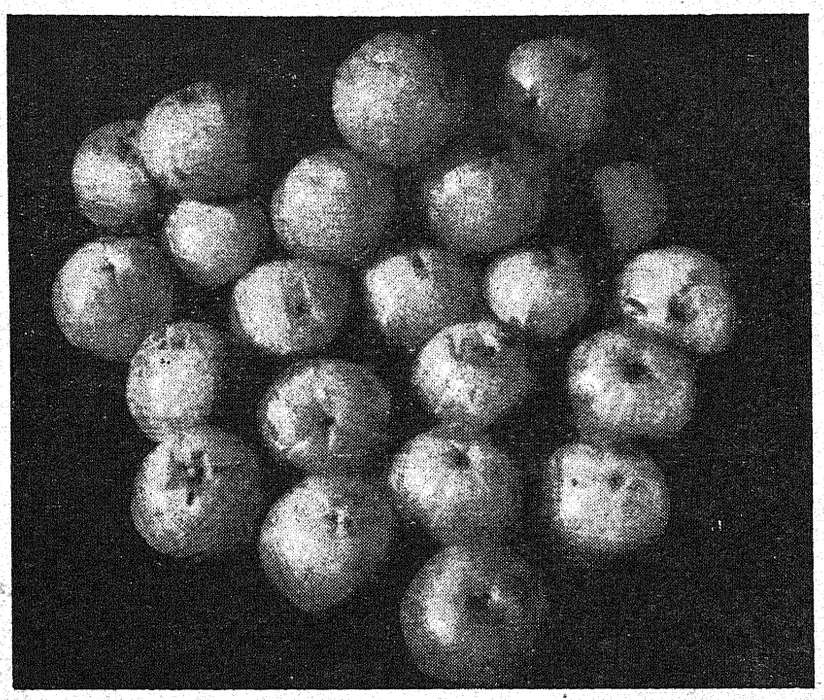
Another interesting feature of this plant is that these giant flowers appear first on these tubers followed by the gigantic leaves. Unlike its other cousins, the tuber of this plant dies immediately after flowering. The year 1961 has been an important one, for, after many decades these plants were seen in flowers in Malaya.

The orthodox botanists, however, may not agree that this is the world's biggest flower, because the spadix is a combination of thousands of small flowers. Nevertheless, to the common man this appears as the biggest flower on earth.

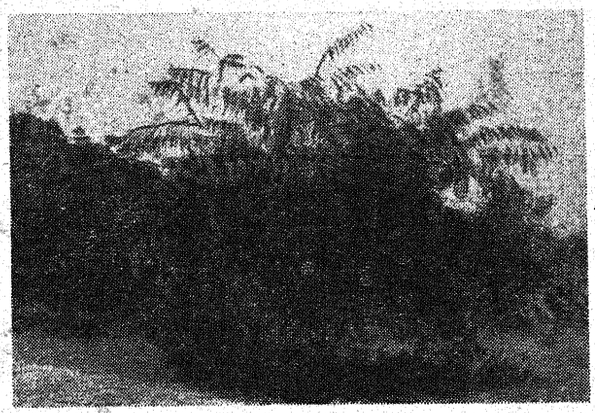
AONLA PROPAGATION



Budding plants of Aonla
1. Patch; 2. Shield; 3. Forkert



Banarasi Aonla—*superior in size and quality*



A four-year-old Aonla *plant (propagated by budding) in flowering and fruiting*

through better budding methods

R.P. SRIVASTVA
Govt., Fruit Research Station, Almora, (U.P.)

Aonla growers who have been raising plants from seeds or by inarching can better switch over to improved patch or shield method of budding which have given excellent results at the College of Agriculture, Banaras Hindu University.

The general practice among farmers is to raise plants from seeds; this often leads to deterioration in the size of fruit. Inarching, on the other hand, produces weak plants. There is also much casualty after transplanting. The new method will ensure higher percentage of survival and produce healthy plants which start fruiting three years after transplanting.

MEDICINAL VALUE

Aonla (*phyllanthus emblica*) is a highly nutritious fruit rich in vitamin C. It is known for its high medicinal value (Varanasi Zone of Uttar Pradesh is famous for growing Aonla). The best variety *Banarasi*, originated from Banaras, produces fruits superior in size and quality. With a view to studying the time and method of budding, an extensive experiment was carried out at the College of Agriculture, Banaras Hindu University, during the years 1960-63. The details of the method of budding and results obtained are described below.

Selection of root-stock. *Aonla* seedlings of about 5-7 months in age, uniform and active in growth, are used; however, 18 months old seedlings can also be used for successful budding.

Selection of bud-wood. The bud-wood (scion) should be taken from a mature, one-year-old twig detached from a healthy and productive tree of good performance.

Method of budding. *Aonla* can be propagated by any of the three

methods, *viz.*, Forkert, patch or shield, but the buds should preferably be covered with alkathene tape for 2-3 weeks depending upon the temperature and humidity. If the temperature is more, the alkathene tape should invariably be removed, just after two weeks; during rains, it can be retained up to three weeks for a good sucess. By covering the buds for such a short period the percentage of sucess is remarkably affected and the union takes place nicely. The suitable size of the prepared buds in the case of Forkert and patch methods must be near about 2 × 1 cm. and for shield one 2.0 cm. in length.

Clipping of the tops. After opening the alkathene tape, the bud-take is ascertained for buds under Forkert and patch methods, and the condition of shield ones is also observed. The proper indications of the bud-take are confirmed, and one-third of the top of the stocks is clipped immediately for initiating the growth of the bud. The terminal 2/3 portion is cut after three weeks of the first clipping, leaving 2-3 cm. above the bud which is evident even in the advance stage of sprouting

It is interesting to note a remarkable success when the second clipping is done in the month of February instead of three weeks after the first. This is done primarily to initiate vigorous growth of the bud after the second clipping during the spring, and secondarily to protect the sprout from adverse winters. The months from November to January are not favourable for the growth of *aonla.* This conclusion was derived while doing the pilot experiments during previous years, and the practice on an extensive scale gave an indication that the budding of *aonla*, done in September, gives excellent results (86-98%) with vigorous sprouts, but the 2/3 portion of the stocks should be removed in the first week of February as described above.

Table showing the percentage of success in budding of Banarasi aonla in the year 1962.

Method of budding	Bud-take (%)	Average time taken in sprouting after budding (days)	Buds sprouted and total success (%)	Survival after transplanting (%)
1	2	3	4	5
1. *5th Feb. 1962*				
(*a*) shield	76	23	76	92.1
(*b*) patch	100	24	90	95.5
(*c*) Forkert	100	25	92	97.8
2. *5th March. 1962*				
(*a*) shield	64	22	62	93.5
(*b*) Patch	100	23	82	95.1
(*c*) Forkert	100	25	86	95.3
3. *5th June, 1962*				
(*a*) shield	60	26	60	96.0
(*b*) patch	100	28	72	100.0
(*c*) Forkert	100	30	78	100.0
4. *5th July 1962*				
(*a*) shield	14	28	14	100.0
(*b*) patch	100	30	30	100.0
(*c*) Forkert	100	32	34	100.0
5. *5th August 1962*				
(*a*) shield	20	27	28	88.8
(*b*) patch	100	29	38	88.8
(*c*) Forkert	100	30	44	90.9
6. *5th Sept 1962*				
(*a*) shield	86	24	86	100.0
(*b*) patch	100	26	94	100.0
(*c*) Forkert	100	27	98	100.0

Time of budding. On the basis of the success achieved during March, June, July, August and September budding, it has been concluded that September budding is the best followed by June and February (Table).

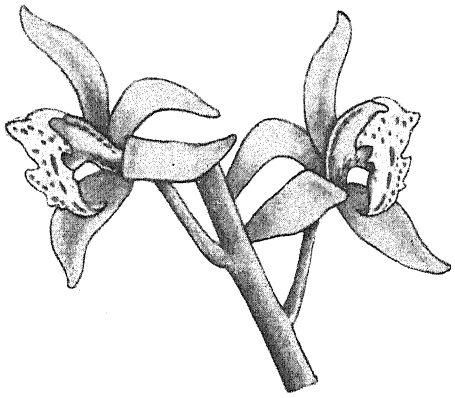
The data collected on various aspects of study revealed the fact that percentage of bud-take was hundred percent in the case of Forkert and patch methods. The June budding initiated earliest sprouts followed by those done in September, February, March, August and July. Maximum success and establishment was observed in the month of September followed by June budding. It, therefore, indicates that *aonla* buds require more temperature with proportionate humidity for their successful union (Table).

It is clear from the table that time factor seems to be very important in budding of *aonla* which is directly dependent on the climatic conditions. The results achieved, therefore, clearly indicate that improved patch or shield method can easily be followed as a commercial technique of *aonla* propagation in the month of September.

NUTRITIOUS BANARASI AONLA

A high-prized variety valued most for making preserves

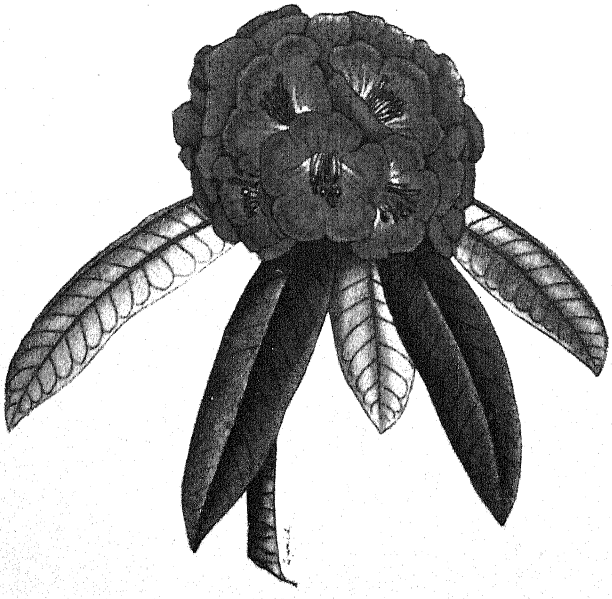
Photo—S. J. SHARMA



Cymbidium grandiflorum

Meconopsis horridula

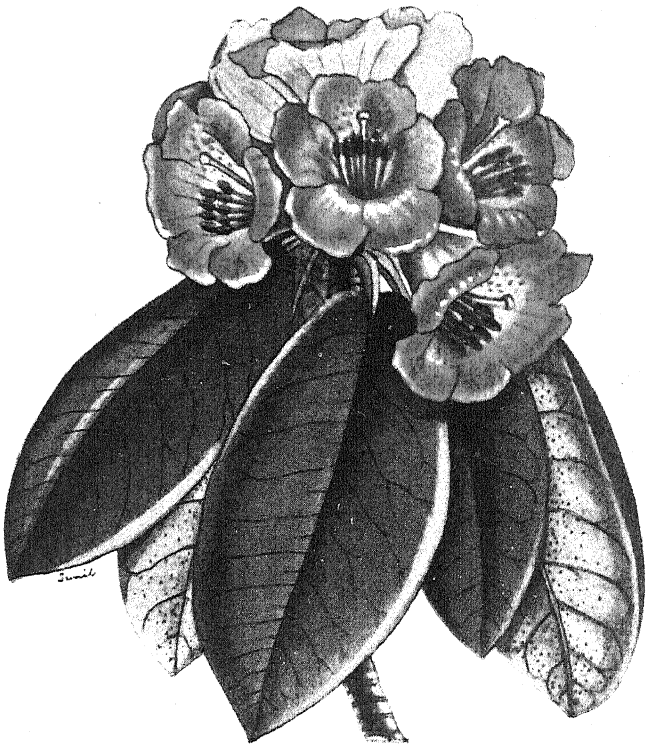
ENCHANTING FLOWERS OF SIKKIM



Rhododendron barbatum

Coelogyne cristata

Lilium nepalense

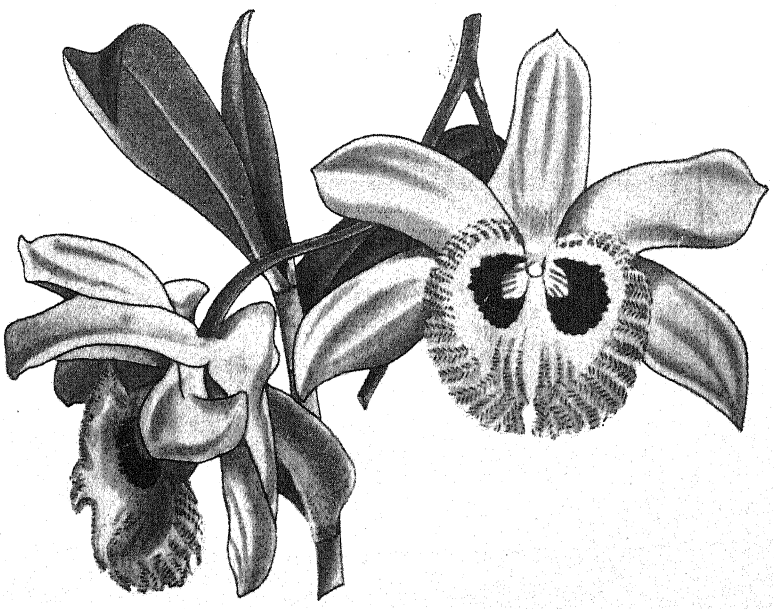


Rhododendron wallichii

Sikkim is a land of snow-capped peaks and winding rivers. Placed at the foothold of the eastern Himalayas, this fairyland, true to its romantic surroundings, abounds in flowers of unnumbered species and varieties. Sikkim's tropical, temperate and alpine regions are flooded with rich flora, ranging from tall sky-high trees to dense thickets and bushy undergrowths.

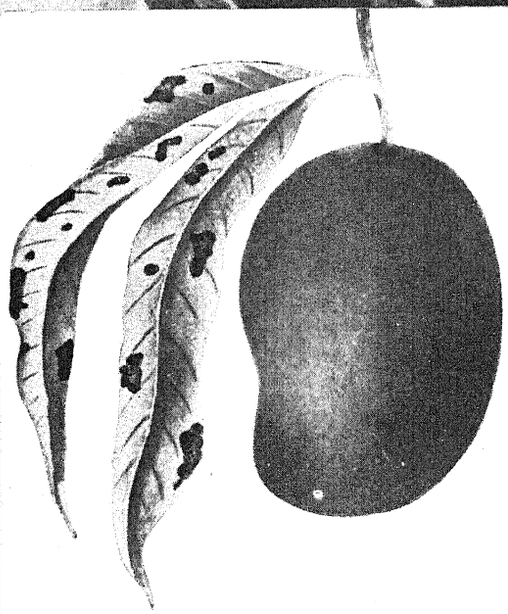
(For details of Sikkim flora, see page 27)

Rhynchostylis retusa

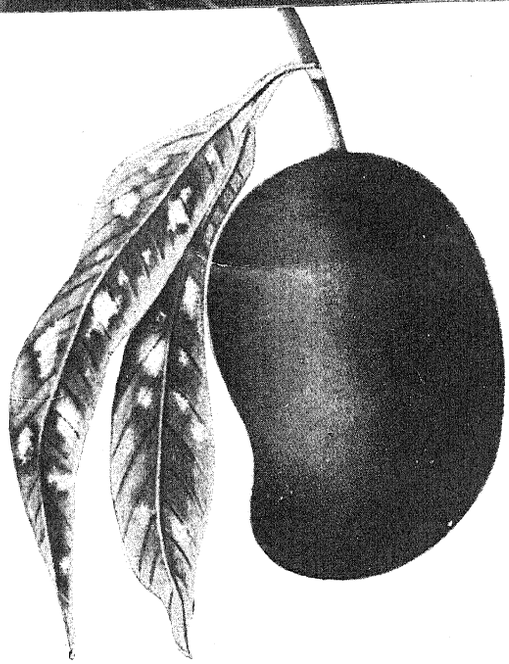


Dendrobium hookerianum

MANGO DISEASES

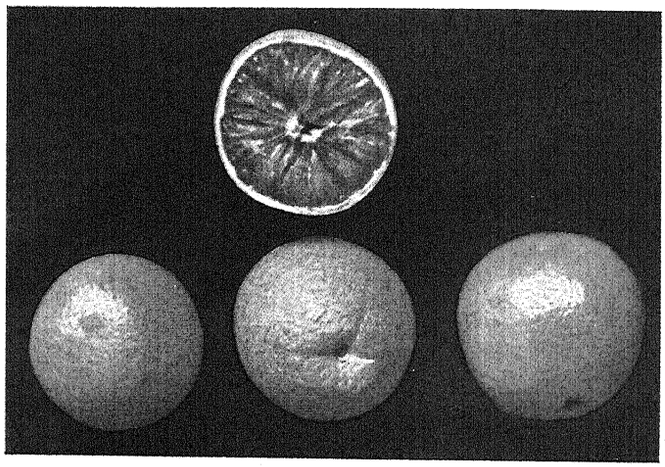


Anthracnose—A widespread fungus disease

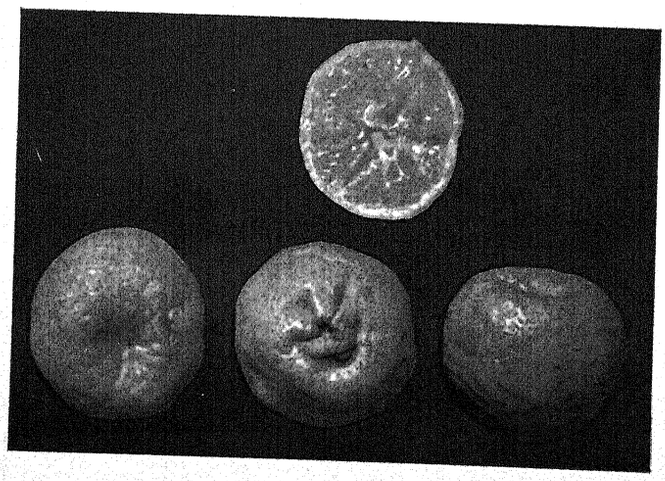


Powdery Mildew—Another common fungus disease

UNUSUAL CITRUS VARIETIES



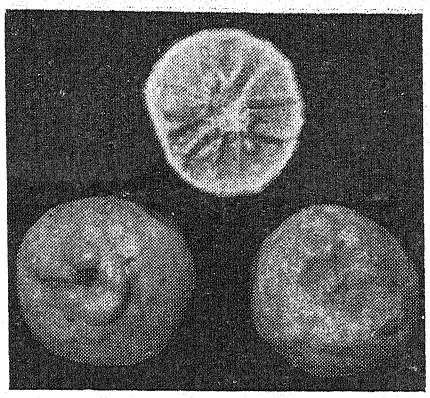
Yuvraj Blood Red—a new clonal selection of
Blood Red Sweet Orange
from Sri Ganganagar, Rajasthan



Seedless Mandarin—a new budspor of Nagpur
Santra from Maharashtra State

SOME NEW AND LESS KNOWN CITRUS FRUITS

DALJIT SINGH
I. C. A. R., New Delhi



Vadlapudi *orange-highly praised for its medicinal properties*

The Second All India Citrus Show was held at Bangalore in January 1964. Many new and unusual citrus fruits from every nook and corner of the country were exhibited at the show. Here is given a brief description and economic value of some of the exhibits.

—Ed.

India is undoubtedly the home of many citrus species of commercial importance, and is fortunate in possessing material that presents so many diversities in season of matu rity, resistance to diseases and pests, dessert and keeping qualities and adaptation to different agro-climatic regions of the country. Exploitation of such a variability towards the improvement of Indian Citrus industry, which is beset with numerous devastating maladies like the citrus die-back confounded by virus complex, citrus root rot and pathogen nematodes, is the main endeavour of the Indian Council of Agricultural Research. Such shows help to bring to light the hidden wealth of citrus flora, and the possibility of exploiting them for economic utilization.

A brief description of the economic characters of some of these new and less known fruits has been attempted here.

YUVRAJ BLOOD RED

This is a new clonal selection of a Blood Red variety of sweet orange, exhibited by Sri Ganga Mechanized Farm, Sri Ganganagar, Rajasthan, a property owned by H.H. Bikaner. The selection has been named after the Yuvraj (Prince).

The fruit is medium sized with ovoid to pyriform shape having a princeton orange colour, flushed with red colour towards the apex at full maturity. The rind is medium thick, rough and semi-glossy. The base of the fruit is conspicuously short necked and the apical end rounded to slightly depressed. The pulp is medium coarse in texture, horse-chestnut in colour, streaked with deep red. The fruit is moderately juicy with excellent aroma and flavour, the sweetness and acidity being well blended. Fruits contain none to few seeds; (total soluble solids 11%, acidity 0.77% and T.S.S./acid ratio 14.3).

It seems to be an early strain and has the additional quality of being almost seedless. The yields are equally good as comparedto the parent.

SEEDLESS MANDARIN

It is a bud sport from the Nagpur mandarin, the fruits of which are almost seedless. This should prove a helpful trait to the canners interested in canning mandarin segments. The fruit was exhibited by Shri Bhagwan Rao Choudhri of Mudkhed, Nanded Dist. in Maharashtra State.

The fruit is medium sized with sub-globose shape having typical short neck. The rind is orange coloured with hollow core, medium thick and puffing. The apical end of the fruit is depressed. The pulp is orange coloured and melting, having abundant juice, good aroma and flavour. The fruits are almost seedless.

KODAKITHULI ORANGE

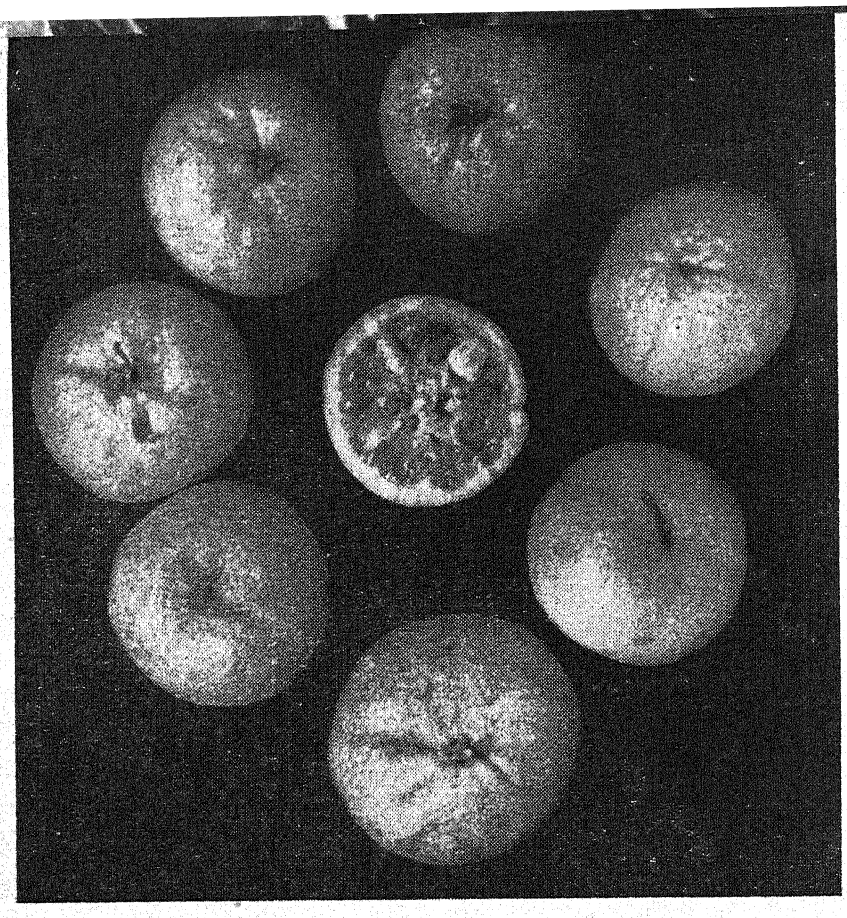
It is a small fruited acidic mandarin (*C. reticulata*), possibly a primitive type, found semi-wild in Coorg and *Malnad* areas of the South. It is also called by other local names such as *Kodathithilihannu* and Wynad country orange. The fruit is much prized locally for offerings in the temples.

The fruit is small sized having oblate shape. The rind is thin, vermellian coloured (toboggan), glossy, rugose and slightly bumpy with few inconspicuous ribs and furrows. The basal and apical portions are slightly depressed. The pulp is uniformly mikado coloured and finely textured with abundant juice which is acidic, possessing weak aroma. Fruits are few seeded, 2 to 8 (av. 5) per fruit, the inner seed coat and chalaza being mandarin-like; (total soluble solids 11%, acidity 1.89% and T.S.S./acid ratio 6).

The variety has a potential use as a rootstock for mandarins due to its hardy nature. It is being tried as a rootstock for Coorg mandarin at the Orange Research Station, Chethali in Coorg, and the reports so far indicate that its performance is as good as the rough lemon.

VADLAPUDI ORANGE OR *KITCHILI*

This fruit takes the name, *Vadlapudi*, from a place called Vad-



Kodakithuli *orange—It has a potential use as a rootstock for mandarins*

lapudi in Guntur district or Circars of Andhra Pradesh, where it was originally cultivated on a commercial scale. At one time, about 5,000 acres were reported to be under this fruit. The same variety is called *Kitchili* in Rayalaseema district of Andhra Pradesh, and a similar fruit called *Belladakithuli* in the Coorg district of Mysore State. Kandhia Local or Karuna local of Orissa are identical to this. All these belong to the hybrid citrus species *C. maderaspatana*, possibly of sour orange mandarin parentage.

The fruit is small to medium sized, having ovoid-globose shape. The rind is medium thick, coloured golden yellow to Florida gold, rough and slightly bumpy. The base is low collared and the apical end truncate. The fruit contains 12-15 segments and has a hollow core. The pulp is tender and finely textured with leg horn colour, very juicy possessing pleasant aroma and flavour. Fruits are many seeded, about 32 per fruit, the cotyledons are light green, inner seed coat light tan and chalaza purplish brown; (total soluble solids 11%, acidity 2.214% and T.S.S./acid ratio 4).

The fruit is highly prized due to its medicinal properties and is relished particularly in summer for its sweetened acidic juice or squash. It has also been found suitable for marmalade making. As a rootstock it has proved a failure for Nagpur orange (*C. reticulata*).

CORRECTION

Oct.-Dec., 1963 issue: Shri Daljit Singh's article "I.C.A.R. has a big role in fruit development", pages seven and nine, paras five and one respectively. Read 'Stionic' for 'Scionic'.

Kew Gardens

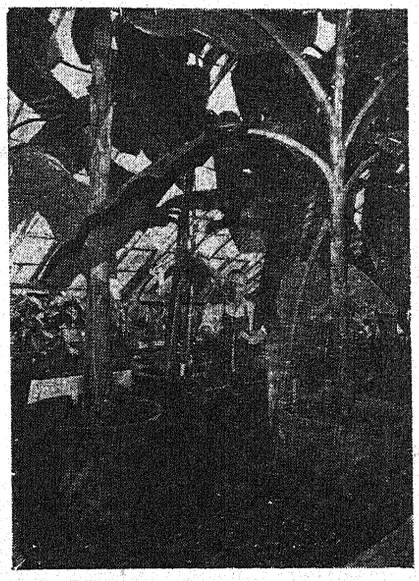
Two Hundred Years of Service to the World

"Go down to Kew in lilac-time, and you shall wander hand in hand in summer's wonderland", said Alfred Noyes. Be it winter, spring, summer or autumn, they are always a garden of enchantment. Kew grows more than 45,000 botanical specimens including 10,000 trees and shrubs and is visited every year by a million and a half people.

For 200 years, Kew's famous gargens have given delight to Londoners and visitors to Britain. They have been—as they are still—a magnet for botanists the world over. For they serve many purposes at once. They are a source of delight for those who wish to relax and feast their eyes; for students and experts in botany and agriculture they offer the finest assortment of living specimens to be found in one place, in addition to a unique library of 45,000 volumes and Herbarium containing 6,000,000 dried specimens. The experts at Kew answer over 10,000 letters a year by post and distribute more than 8,000 parcels of seeds and plants every year to over 100 different countries.

WORLD WIDE COLLECTIONS

Kew is a showplace for plants not only from all over the Commonwealth, but from most other countries. The travels and researches of enthusiasts, and the painful study of the horticulturists associated with Kew through many generations, have done much to raise the prosperity of the Commonwealth countries besides benefiting Britain.



The Kew Quarantine. Kew is the 'Word of honour' that the plants are disease free.

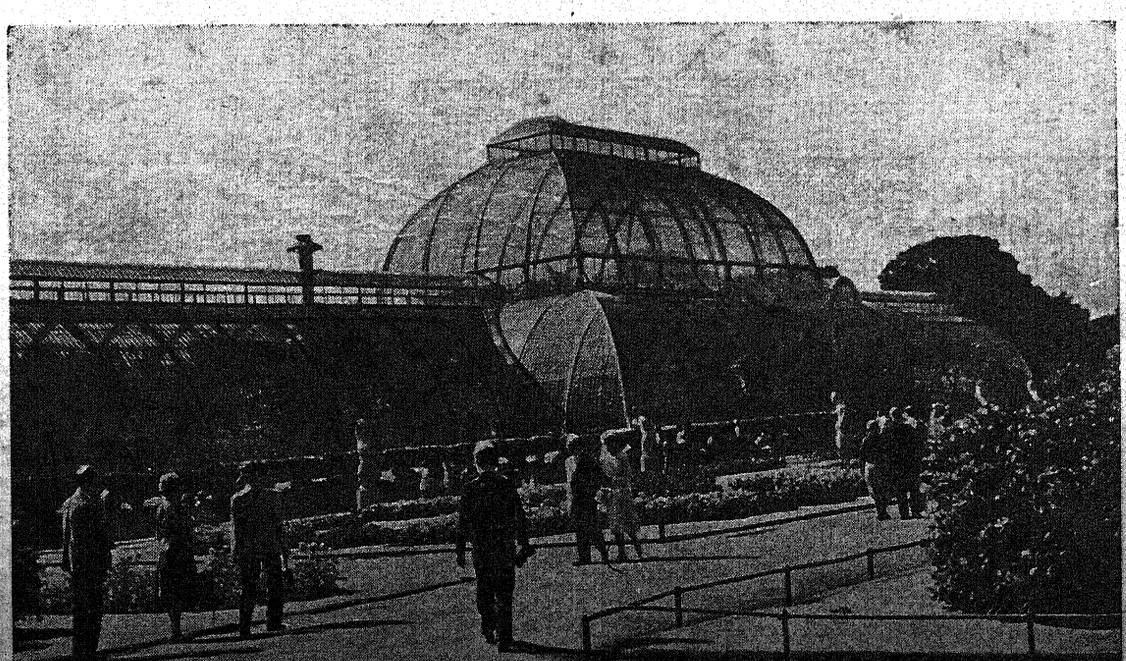
It was a Kew gardener, for instance, who helped to introduce the bread-fruit tree in Jamaica. It was another Kew gardener, David Nelson who journeyed to Australia with Captain Cook and sent home the first specimen of eucalyptus.

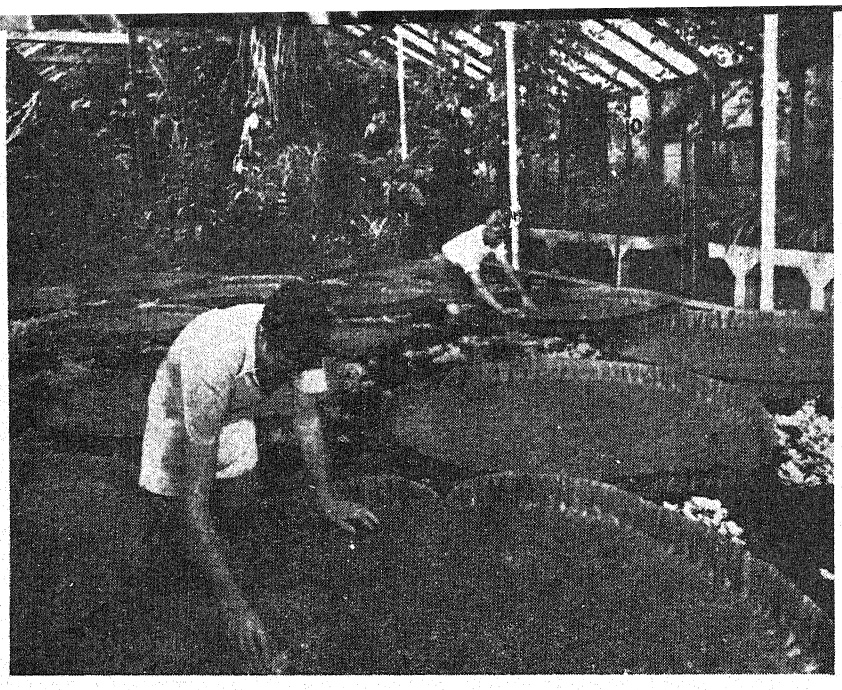
Under Sir William Hooker, Kew gave a horticultural lead which was to bring new foodstuffs and medicinal plants to countries which had never even heard of them. Valuable products such as tea, coffee, cocoa, pineapple, bananas and quinine were all made available to new territories because plants or seeds were brought to Kew, their possibilities investigated and appreciated.

RUBBER INDUSTRY BEGUN

The introduction of cinchona, the quinine plant from South America to India was only one of Hooker's triumphs. So, too, was the trans-

The great Palm house at Kew where palms and other plants grow under artificial tropical conditions





The leaves of the giant water lily are being cleaned. The leaves reach a size of up to six feet across.

planting of rubber. Once the only rubber was obtained from *Hevea brasiliensis* from forests on the banks of the Amazon. Experts from Kew sent seeds home, plants were raised in the botanical gardens and in due course a thousand plants were sent to the Malay Peninsula and to Ceylon. The tremendous economic benefits to Malaya of this far-sighted step are evident today ; for, as Kew experts had predicted, the plants flourished there and the rubber industry took root and grew.

The despatch of valuable plants and seeds to other countries is still carried out at Kew, and its immense resources of technical data made available to all who have a use for them.

CONTINUED FROM PAGE 13

HARDY HYDRANGEA

weak liquid manure every ten days. This will improve the size and quality of blooms. From flower bud initiation to full development of the panicle and blooming, it takes about 10 to 12 weeks. Once the corymbs are fully formed, they retain their freshness for over a month after which the petals begin to turn brown. Flowering is observed to be scarce between October and January.

The bush should be pruned every year. Pruning consists in cutting back branches of the previous year to 8 to 10 buds, according to growth of branches and the desired size of panicles. A Hydrangea bush well fed and tended, which includes removing all dead wood and leaves periodically, is known to grow and flower well for 40 years or more. The plant is seldom affected by any pest or disease.

In a large garden, it is best to plant the different colours separately if three or four different varieties are used; each variety should be massed on its own. Indiscriminate mixing of colours will be out of place. For its ease of culture, its perennial nature and the richness of reward in yielding abundant bloom which lasts long, the Hydrangea must merit an important place in any scheme of gardening on the hills of South India. The remarkable performance of Hydrangea on our hill stations calls for early introduction of many a notable variety from the United Kingdom and other places to enrich the ornamental wealth of our country.

MANGO DISEASES

Anthracnose and Powdery Mildew

Anthracnose is the most common and widespread fungus disease of mango which is prevalent in almost all the mango-growing regions of the world. In India, the disease is common in the moist climates of Tamilnad, Kerala and Assam.

Symptoms. The disease is caused by the fungus *Colletotricum gloeosporioides*. It mostly attacks the tender portions of the mango tree such as young leaves, stems, flowers and fruits. On the twigs, the disease appears in the shape of small black spots. Dark brown spots develop on the leaves also. The attack becomes especially serious if untimely rains occur during the flowering period. Fruits of all ages may be affected and the young fruits may shed. Black spots also develop on older fruits and they increase as maturity approaches. The skin of mature fruits gets badly disfigured by the black spots. The pulp beneath the spots usually becomes hard in texture. The general appearance of the fruits is marred, and this lowers their market value. Fruits may also rot in storage as a result of attack by this fungus; but luckily only a few varieties are found susceptible to it.

Control. The most reliable and effective fungicide for the control of anthracnose is Broadeaux mixture (copper sulphate 3 lb., quick lime 3 lb. and water 50 gallons). It is sprayed two to three times within two weeks before the blossoms open and also at intervals of three or four months during other dry periods of the year. In Assam, 3 sprayings a year are recommended in the month of February, April and September. All diseased and dead branches which usually carry spores of the fungus should be promptly removed and burnt. Again, to control the rot in storage, it is advisable to store the fruit in ventilated rooms, taking care that the skin is undamaged.

POWDERY MILDEW

Powdery mildew is another serious disease of Mango. It is mostly prevalent in Uttar Pradesh, Bombay and South India. In the Indo-Gangetic region, the disease does not commonly occur, but can occasionally be found on malformed inflorescences. Losses due to this disease sometimes range from 5 to 20% of the total crop mostly during the months of February and March.

Symptoms. The disease is easily distinguished by the whitish appearance of the affected blossoms which appear as if dusted with fine white flour. It generally makes its first appearance on the scales, fruits, flower buds, and leaf stalks of the plants. The minute spores (seeds) of the fungus are carried away by wind from affected flower heads to the hairy unopened flowers, which become diseased and produce spores from within five days from the time of infection. The process of spore formation and secondary spread continue as long as conditions favourable to it persist. It is thus obvious that a few affected flowers can cause a widespread epidemic under favourable climatic conditions. Warm temperature and humid conditions favour the disease.

The white appearance of the diseased blossoms, is due to the thick covering of spore and mycelium or the vegetative parts of the fungus. The fungus feeds on the outer cells of flowers and very young fruits, which consequently dry up and drop down. Powdery mildew, though not as destructive as the hoppers, may cause a loss of figure up to 20 per cent, mostly during the months of February and March.

Control. The disease is best controlled by the application of a mixture of D.D.T. dust and finely ground sulphur (325 mesh). Guesarol 405-50 consisting of 5 per cent D.D.T. and 50 per cent sulphur has been considered an ideal remedy for both hoppers and mildew. D.D.T. content in the mixture, kills the hoppers outright while sulphur is preventive and curative against mildew. If D.D.T. dust is not available, dusting trees with finely ground sulphur (325 mesh) alone would help in warding off the attack of the hoppers to a very large extent. While the use of sulphur alone in dusting mango trees is safely recommended the use of D.D.T. dust alone is strictly prohibited. This caution is important because D.D.T. alone no doubt kills the mango hoppers effectively but it fosters the appearance of another insect pest called "mites" which cannot be killed by D.D.T. These mites are very minute insects invisible to the naked eye.

Dusting mango trees can be done at any time of the day. Gently blowing breeze helps the dusting operation whereas the high wind results in waste of material. The best time for dusting are the still days. Normally, about 2 lb. of mixture is required to dust a tree of about 25 feet height. Larger tree require about 3 lb. for one application. If untimely rain washes off, the dust, before there have been three or four days of sunshine, dusting must be repeated. (I.J.D.)

TATA-FISON AND RALLIS — they "know-how"!

"Demonstrations," *said Tata.*

"You mean brass bands, flags, pretty girls?" *Fison asked hopefully.*

"Useful demonstrations," *said Ralli, bringing him down to earth,* "to show farmers how our fertilizers and pesticides grow better, healthier crops and protect them, too!"

Tata-Fison and Rallis have combined their separate marketing organisations into a single, unified service. For the future, all Tata-Fison products will be marketed by Rallis' Fertilizer and Pesticides Division. The merger will prove of immense benefit to the Indian farmer. For the first time, one integrated service will provide advice and products covering both crop growth and crop protection throughout the country...a notable contribution to the cause of agricultural progress.

TATA-FISON RALLIS COVER THE FIELD!

SIKKIM FLOWERS

BRIGHT AND FRAGRANT

S. K. MUKHERJEE
Botanical Survey of India, Calcutta

The State of Sikkim in the eastern Himalayas, with snow-capped peaks and torrents running along deep gorges, is covered by a rich flora which is tropical along some distance of Teesta valley, changing to temperate and alpine as we go north and east towards Tibet border.

The tropical and subtropical regions with a higher rainfall favour the growth of tall trees with dense undergrowth and extensive climbers, forming quite impenetrable thickets all over. In such forests we meet the noble Horse-chestnut, *Aesculus khassyana* with yellow-centred white flowers in long-branched panicles, which are very conspicuous on a dark green background. *Schima wallichii* is common upto 1000 m. It flowers profusely, and the white fragrant flowers are strewn all over the floor of the forest in summer. Groves of *Mussaenda* with large yellowish floral leaves fluttering in the wind, attract the attention of the travellers. White-flowered *Ixoras* are common. *Clerodendrum squamatum*, a small shrub with large branching inflorescence of deep scarlet colour is a thing of beauty. *Cl. serratum* has flowers with a mixture of white blue and purple colours. *Cl. siphonanthus* with long tubular white flowers raise their spikes from the surrounding thickets. *Melastoma malabathricum* with mauve-purple flowers are common upto 1000 m., and are replaced at higher attitudes by *M. normale* with flowers brighter in colour. There are also *Osbeckia nepalensis*, *O. stellate* and *O. crinita* of the same family.

Hedychium coccineum with dense spike of bright crimson flowers is the pride of subtropical forests. *H. coronarium* has large white fragrant flowers. To the same family belong the *Alpinias* and the *Cautleyas*. *Alpinias* are tall herbs with large flesh-coloured flowers in long recemes. These grow in tropical valleys while *Cautleyas* are temperate. *Cautleyas* have yellow flowers and are often epiphytic.

Beaumontia grandiflora is an extensive climber of the tropical valleys with large white funnel-shaped flowers. *Bauhinia vahli*, *Milletia*, *Mucuna*, *Vallaris*, *Chonemorpha*, *Porana* are other climbers of the lower hills with beautiful flowers. *Thunbergia coccinea* hangs its long pendulus branches of scarlet flowers in brown spathes. There are jasmines with fragrant white flowers mostly in the lower valleys while *J. dispermum* grows above 2000 m. with lilac flowers.

Crawfurdias with large purple trumpet-shaped flowers grow at about 2000 m. and above. These are the climbing *Gentians*. True *Gentians* are small herbs with blue flowers, and these are abundant on open grounds in temperate region. *Fragarias*, yellow and crimson *Potentillas*, *Geraniums*, *Epilobiums* and *Rubus calycinus*, a trailing herb with white flowers like *Fragaria*, white and purplish *Violas*, all grow with the *Gentians*. White and pink clovers are as common, and the Australian Daisy is almost everywhere. *Parochetus communis* with blue flowers trails along meadows and hill sides, while *Campanulas* hang their blue-bells in the air.

Sikkim can boast of her Orchids, of which there are about 450 species in the State. *Dendrobium*, *Coelogyne*, *Cymbidium*, *Aerides*, *Saccolabium*, *Pleione* etc., which are epiphytes, and the terrestrials like *Phajus*, *Eulophia*, *Arundina*, *Cyprepedium*, *Calanthe* etc., are the most beautiful and quite common. In the tropical and subtropical valleys, Orchids are abundant, and are also fairly common at the temperate region. *Calanthe alpina* occurs very near the alpine zone at an elevation of 3000 m. and above. *Cyprepedium elegans* and *C. tibeticum* climb higher. *C. fairieanum* and *C. venustum*, two most beautiful orchids, grow in the tropical valleys. *Dendrobium* has the largest number of species with yellow, mauve, purple, or whitish flowers or with flowers of mixed colours. The Orchid flowers are peculiar in shape and a few are fragrant.

Before we come to the temperate region, we come across shrubs like *Luculia*, *Hypericum*, *Reinwardtia*, *Lobelia*, *Buddleia* and *Polygala*. *Luculia* has slender tubular pink flowers in dense clusters. Flowers of *Hypericum* are yellow. *Lobelia* has pink or white flowers of peculiar shape crowded in long spikes. Flowers of *Buddleia* are white or mauve or pink in dense spikes which are either branched or simple. *Polygala arillata* is a beautiful shrub with yellow flowers in drooping racemes. Here we get *Edgworthia gardneri* with yellow flowersc lustered in globose heads. This beautiful shrub is found upto an elevation of 2500 m.

At an elevation of about 2000 m., we meet *Cornus capitata* (*Dendrobenthamia capitata*)., a short-sized tree with small flowers in globose heads surrounded by four large yellow petal-like floral leaves. With this we get the Cherris (Prunus) with profuse pink or white flowers on leafless branches or with young leaves in Spring.

FRAGRANT RHODODENDRONS

Above 2000 m., we come to *Rhododendron* forests. There are over 40 different species in Sikkim. A few of these are trees and the rest are shrubby, becoming dwarfs at an altitude of 4000 m. *R. arboreum* with scarlet flowers, known as *Gorans* by the local people, is common at the foot of the temperate zone. Along with this, grow *R. barbatum*, *R. cinnamomeum*, both having scarlet or crimson flowers, *R. dalhousiae*, *R. lindlevi*, *R. grande* and *R. vaccinium* with yellow, white and rose-coloured flowers. *R. campanulatum* with mauve flowers, *R. cinnabarinum* with pendant reddish flowers and *R. triforum* with yellow flowers grow at an altitude of 3000 m., and higher. At 4000 m., the two dwarf *Rhododendrons*, *R. lepidotum*, with yellow flowers, and *R. anthopogon* with white flowers, are common. The leaves of both of these are aromatic, and are collected for burning as insence.

SURPASSING MAGNOLIA

In the *Rhodendron* forests, we meet *Magnolia campbelli*, superb with its large pink or white flowers which appear in March-April on leafless branches. The flowers are as large as 25 cm. in diametre and make a wonderful sight against a background of crystal clear sky. There are but few examples in the whole of vegetable kingdom that can surpass in beauty the flowers of this Magnolia.

In the temperate zone, we find also the yellow-flowering *Berberis* and *Mahonia*, *spiraea* and *Cotoneaster* with white flowers, wild roses and *Daphne* with white or pinkish flowers. There are *Vacciniums* and *Pentaptery-gium* with small panicles of urceolate or tubular flowers, yellowish or pinkish in colour. These are usually epiphytes, often found on rock crevices. Spiny shrubs of *Morina*, *Dipsacus* and *Cnicus* also lend their colour to beauty the landscape.

Among the herbaceous group *Primula* occupies an important place. There are about 30 of them, some growing in open places and some in the shade, with purple, lilac, rose, yellow, white or bluish flowers. They are more in the cooler region of the temperate zone and in alpine zone.

Along with *Primulas* we get *Polygonatums*, *Iris clarkei*, *I. nepalensis*, *I. goniocarpa* and many *Composites* of which *Senecio*, *Anaphalis*, *Aster* and *Gnaphalium* are common. Monkshood or the *Aconitums* are common above 3000 m. Closely allied to the *Aconitums* are the *Delphiniums* which grow side by side. Both have blue or bluish purple flowers which are spurred and irregular in shape. There are also the *Anemones* which although belonging to the same family as the *Aconitums* and *Delphiniums*, have white or yellow flowers of a regular shape. On open slopes, usually at alpine region, we get *Pedicularis*. There are some 40 species in Sikkim which are herbaceous plants with spikes of bilabiate yellow or rose-coloured flowers. Some of these climb above 5000 m. reaching the perpetual snow-line.

Encouraged by the general climate of Sikkim, particularly of the subtropical and subtemperate regions, the local people grow many show ornamentals of which a major portion is exotic. This is evident if we take a look round the gardens of Gangtok, the capital of Sikkim, where there is a profusion of different kinds of Roses, *Wisteria sinensis*, Potato-vine, Passion flowers, *Camellias*, *Azaleas and Tibouchina semidecandra*. There are *Gladioli*, *Pelargoniums*, *Begonias* (indigenous and exotic), the Lilies, *Crocuses*, the Snowdrops etc., and a large number of annuals. *Fuchsia hybrida* of Mexico is very popular, and every garden appears to have at least one represented there. (For colour illustrations, see centre pages.)

"Flower shows are encouraging, but nothing is as helpful to the flower grower as the frequent visits of V.I.P.s"

NEWS ROUNDUP

Citrus & Vegetable Show at Bangalore

The Citrus and Vegetable Show organized by the Indian Council of Agricultural Research, in the Glass House of Lalbagh, Bangalore in January, 1964 attracted a great number of entries from all over India.

As many as 254 exhibitors participated in the Second All India Citrus Show, the exhibits totalling 581. The maximum entries were received from Mysore, followed by Rajasthan.

120 exhibitors took part in the First All India Vegetable Show and the entries totalled 411 samples.

The citrus fruits on display included mandarin, sweet oranges, lemons, limes, grape-fruits, pommeloes etc., while in the sections for home-made and commercial citrus fruit products one could feast one's eyes on attractive specimens of preserves like pickles, marmalades, squashes, juices, preserved segments, ready-to-serve drinks. In the Vegetable Show most of the vegetables and common vegetable products were on display. Various firms dealing in sprayers, pesticides, fungicides, fertilizers and implements participated in the Show.

Yuvraj Blood Red, a strain of Blood Red Malta, displayed by the Superintendent, Sri Ganga Mechanised Farm and Orchard, Sri Ganganagar (Rajasthan), and seedless mandarin displayed by Shri Bhawan Rao Chaudhury, Mudkhed, Dist. Nanded, Maharashtra State stole the Show.

Among the vegetables, pumpkins and tomatoes received many varieties.

At the Vegetables Show, Shri K.M.S. Reddy, Commissioner of Income Tax, Bangalore among the private growers, and Government Vegetable Research Station, Kalyanpur, Kanpur, U.P. among Government Research Stations bagged a large number of prizes.

For getting the highest aggregate score at the Citrus Show, Mysore State was awarded a running shield.

Russian Grapes

An experiment in gowing Russian grapes is being conducted at the Agricultural College and Research Institute, Coimbatore. 14 varieties of Russian grapes are being grown in a plot in the college campus to determine finally the suitable varieties. It is claimed that Russian grapes contain 25 per cent sugar compared to 14 per cent in other varieties.

Flower & Vegetable Show

The Delhi Agri-Horticultural Society organised a Flower and Vegetable Show in New Delhi on 15th February, 1964. The exhibits showed brighter colour, fuller bloom and healthier foliage.

Elegant gladioli, exquisite branching stocks, stately clarkias, tiny anemones and narcissus, patted and miniature roses, giant pansies and bold cinerarias spoke well of the Delhi Citizens, interests in flowers.

Among the exhibits were such rarities as ranunculus, adonis, statice and bells of Ireland—varieties which were considered extremely hard to grow in Delhi. The miniature deep blue grape hyacinth drew much attention in spite of the giants around it.

The show had a special attraction in its international stall, displaying glamorous orchids from Singapore, California, and Los Angeles.

The highest aggregate marks in the show were scored by Mrs. V.P. Agnihotri who won Dr. Zakir Husain's challenge cup.

Kitchen Garden Competition

The Fourth Annual Kitchen Garden Competition organised by the All-India Women's Central Food Council was held in Delhi on 9th February, 1964. About 300 persons took part in the competition. The prizes were distributed to the winners by Dr. Ram Subhag Singh, Minister for Agriculture. Speaking on the occasion, Dr. Ram Subhag Singh emphasized the need to grow kitchen gardens. He said that even though kitchen gardening is an economic proposition, most people felt shy of it because of the labour involved. This attitude should go, he added.

Horticulture in Border District

The Border District of Pithoragarh, where horticultural development is being carried out on a priority basis, will become a rich fruit-growing region of Uttar Pradesh in a few years.

Since the creation of the district three years ago, the three multipurpose horticultural farms at Balanti, Sirkha Quenti and Binsar have been expanded considerably. Two new nurseries have also been established at Tal and Badalu. These farms promise to make the district self-sufficient in all varieties of fruit plants. Already, these farms have produced 4, 45, 117 plants, and over 10,000 pounds of vegetable seeds.

The district has also raised eight mobile horticultural teams, one for each development block, to educate the farmers in the latest methods of orchard keeping, grafting and budding, eradicating plant diseases and use of improved vegetable seeds. Since January 1960 more than three lakh fruit plants have been distributed in the development blocks by these mobile teams.

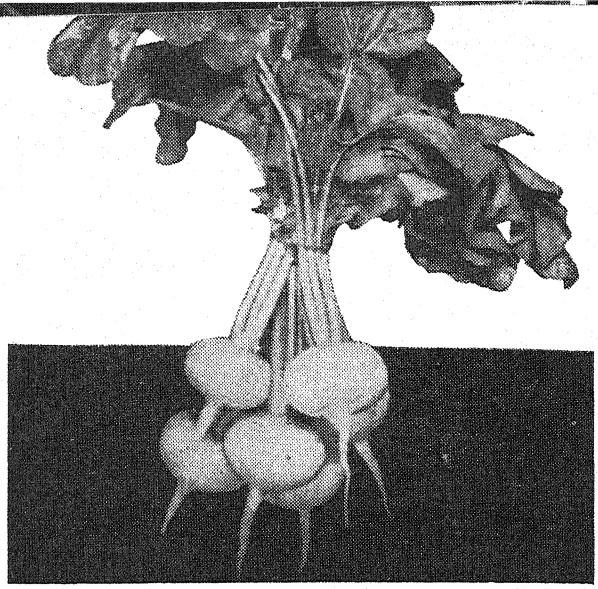
For utilizing the surplus fruit produce, a community canning centre has been opened at Pithoragarh which also serves as a training centre. Training classes in fruit pre-

CONTINUED ON PAGE 30

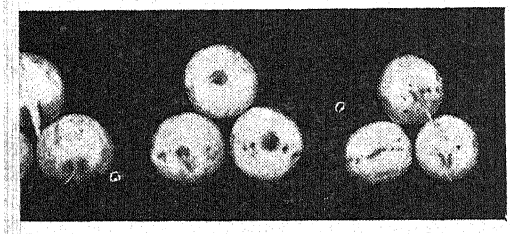
BOLDER SEEDS

For Better Turnip Yield

KARAM SINGH SANDHU
UJAGAR SINGH KANG AND
NAZAR SINGH DHESI
College of Agriculture, Ludhiana



Good quality graded seed ensures healthier yield performance



Size of root balls from different sizes of Seeds

It is commonly believed that in short duration crops seed size plays an important role in securing early germination, better stand and higher yield performance. This belief was put to scientific test on turnip 4 White, a local improved strain of the Punjab, during the years 1959-60 and 1960-61. With the help of Dockage Sieves, the seed was graded into 'bold' (above 0.067 inch), 'medium' (below 0.067 inch and above 0.050 inch) and 'small' (below 0.050 and above 0.040 inch) sizes and subjected to germination tests in the laboratory on blotters at a temperature of 20°C as well as in sand simulating field conditions. Proper moisture supply was assured in either case.

Bold and medium seed showed nearly identical performance in germinations on blotters with about 91 per cent success, while the small seeds begot 86 per cent germination, excluding of course the abnormal, which would not normally emerge in sand or soil.

In the corresponding germination test in sand, again there was no difference in the relative success of bold and medium seeds recording 87 and 86 per cent seedling emergence, but the small seeds fell far low in performance with a seedling emergence of 62 per cent only. Clearly, the weaker seedlings arising from smaller seeds have a lesser chance of emergence under field conditions than the germination capacity indicated in the laboratory test, which was only slightly lower than that of bold and medium seeds. These results are based on the average values obtained in trials conducted over two consecutive seasons.

The bold and medium seeds completed their germination in 4-5 days while the small seeds did so in 7-8 days. Thus, the small seeds are not only low in germination percentage but also slow in germination rate.

The average weight of the turnip ball after 60 days of sowing was 172, 167 and 137 gm. from bold, medium and small seeds respectively. The small seeds, therefore, end in low production.

In order to ensure the advantages of early germination, good plant stand and high crop yield, a wise grower will always employ quality graded seed from which the small immature seeds are meticulously eliminated.

CONTINUED FROM PAGE 29

NEWS ROUNDUP

servation are being held all over the district.

Bananas Abroad

Bananas have proved a very agreeable fruit with the Moscovites. In one week the entire stock of 4,000 tons of fruit disappeared from the stalls. Bananas have also found a very favourable market in Italy, Iran and Iraq. Mr. Manubhai Shah recently announced that Italy had asked for 13,000 tons, Iraq 6,000 tons and Iran 5,000 tons. Exports to the Soviet Union alone were worth of Rs. 17 lakhs, and the despatches now to be made will bring in not less than one crore of rupees to the exchequer.

What a man needs in gardening is a cast-iron back, with a hinge in it.

—C. D. WARNER

Book Shelf

ROSES. Text by Eric Bois; Illustrations by Anne-Marie Trechslin. Translated into English by J.W. Little, Thomas Nelson and Sons Ltd., Parkside Works Edinburg 9. Pp 128 (with 60 plates); 84/-Sh; 1962.

No other flower perhaps has a greater legend than rose; its place is unique in literature and life, in parables and paintings. Kings and queens favoured this flower. Poets and painters gave it a place that should be the envy of the rest of the botanical kingdom.

This book on roses, and English translation by Mr J.W. Little from the original in French by Mr Bois has gone through two editions in one year, a clear indication of the quality of the translation as well as its popularity.

The author Mr Bois is a specialist on roses with international reputation as a Director of Displays for Geneva parks and promenades and the creator of Geneva Rose Garden. He worked as a judge at the international rose contests in Paris, Rome, Madrid and Lyons and a Chairman of the committee of the Geneva international contests for New Roses.

The book gives a comprehensive picture on every aspect of rose growing and this may be useful not only to the amateur growers but to the professionals also. The history of the symbolism of rose, its reference in literature and its usefulness are all of absorbing interest.

As a specialist, the author has described the difficulties of raising new varieties, maintenance of stock and other cultural practices. He puts forth a strong plea for raising new varieties as a routine to maintain the outstanding qualities. To quote Mr Bois, "The reason is that roses behave like almost all cultivated plants in that they gradually degenerate, often within a few years, the further they get from the wild species. Such degeneration arises from certain defects in the rose, defects which only gradually appear but increase steadily, such as weak growth, less frequent flowering, blooms that lose their double nature and their colour, or a decrease in the plant's resistance to disease. As the years pass, too much propagation can also result in a weakening of the qualities of a rose."

A rose grower, the author says, can become rich very quickly if he can find a variety of really great merit in the international class. The book gives information about the diseases and pests etc., and remedial measures also.

Miss Trechslin, the co-author and artist has very competently and superbly done the difficult task of reproducing the different rose varieties in their true tints and shades. The book is a bit costly and is rightly so because of the 60 colour plates.

—M.P.G.

YOUR GARDENING PROBLEMS....

Q. Kindly suggest from where I can buy good plants of plum varieties, Beauty Maripose and Hali.

—B.D. Rajkumar
NABYAL, (AMBALA)

Ans: The plum varieties can be had from the Assistant Horticulturist, Kandaghat, (Punjab). The planting season of the plum plants is in January–February when they are in dormant condition.

Q: I would like to grow fruit trees like Barbados cherry, Poona figs and Grape selection 7 (Poona). Please inform me where these plants are available. I would suggest the publication of a Directory of reliable seeds and plants (fruits) suppliers in 'Indian Horticulture' for readers' guidance.

—S. Mani Pradhan
KALIMPONG (W. BENGAL)

Ans: The planting material of the above fruit varieties can be obtained from the Horticulturist, Government College, Poona. It will not be proper to publish the list of suppliers of reliable seeds and fruit plants in Indian Horticulture. There is no central law for registration of nurserymen and seedmen at present, and, therefore, certification regarding the reliability of nurserymen is not possible. The best course would be to take advice of the State Department of Agriculture or take plants from Government gardens or horticultural stations.

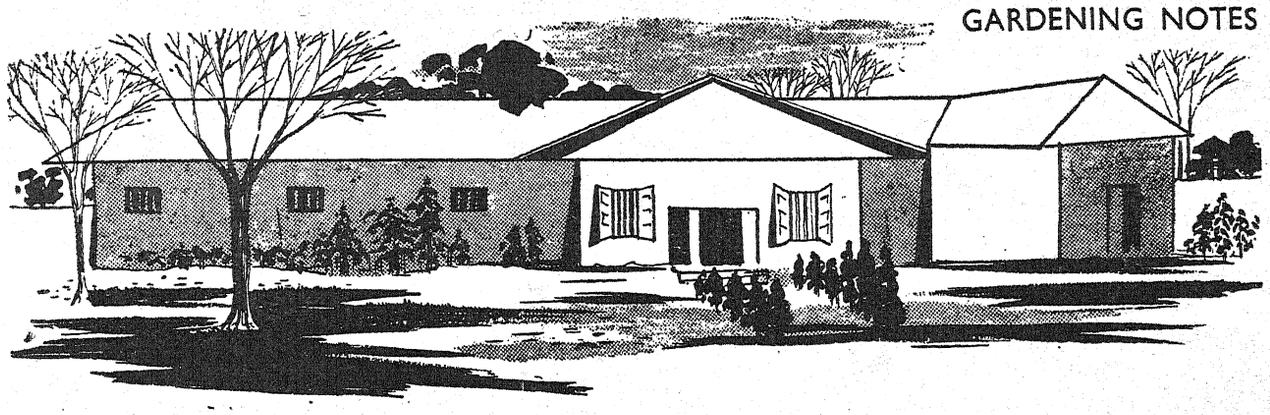
Q. Some of my citrus plants are affected with sun-burn, canker and die-back. What measures do you recommend to counter them ?

—Y.A. Gupta
SAHARNPUR (U.P.)

Ans. Citrus trees in Northern India frequently get sun-burnt, particularly those portions which face southwest aspect. Sometimes, this results in cracking of the bark. The injury can be prevented by keeping the tree low-headed by proper training so that the lower branches effectively shade the trunk of the tree. Exposed trunks can also be covered by straw, paper or gunny cloth. Another effective method is to white-wash them.

Canker can be controlled to some extent by pruning the affected parts and spraying the tree with Bordeaux mixture (8 :5 :50). An adhesive can be mixed with the fungicide for better results. Recent experiments in Andhra Pradesh have shown that a spray with a water extract of 'neem cake' (50 lb. in 20 gallons of water) is useful in the control of canker. Planting of canker-free plants is a good preventive measure.

Citrus die-back is a general term in this country signifying any of a group of maladies like withertip, mottle leaf, virus diseases or malnutrition arising out of abnormal soil and water conditions. Unless the precise cause is diagnosed, it is difficult to prescribe a remedy.



Best Time For Ramblers and Summer Annuals

(April-June)

Roses complete their last flush of blooms by the middle of April. However, the ramblers, which bloom only once a year, come out in abundance in the month of April. They are usually late to flower in the plains. All ramblers can be propagated by budding or cutting.

The bulbs of Galadium, Arum, Gloriosa, Curcuma, Achimenes and Zephyranthes can be planted in April. Caladium is propagated by the tuberous rhizomes which are planted in a soil mixture consisting of one part each of soil, leafmould, cowdung manure and sand. A well drained soil is very essential for caladiums. The first few leaves are usually green but from the fourth or fifth leaf onwards the true colours appear on the leaves. Caladiums are one of the best foliage plants with the most exquisite and brightly coloured leaves having green, red, pink or white colours with blotches or dots of various colours like pink, red, green and white. The leaves are also crinkled and translucent. One of the recently introduced varieties in our country is the fancy lance striped leaved caladium which has very attractive colour combinations.

The Glory lily, *Glaoriosa superba*, a native of South India, is very popular in the gardens. The other species commonly used are *G. rothschildiana*, *G. carsoniil* and *G. Virsecens*. The six outstanding varieties of Gloriosas collected from Africa by Mr. S. Percy Lancaster and being grown at the National Botanic Garden, Lucknow are Bronze Spider, Purple Prince, Green Gem, Twisted Tips, Aurora and Pink Pearl.

SUMMER ANNUALS

Seeds or the summer season annuals like Sunflower, Portulaca, Gaillardia, Tithonia, Zinnia, Gomphrena and Amaranthus may be sown in April. The rainy season annuals like Cosmos, Balsam, Torenia etc., can be sown in May-June. Marigolds may also be sown during that time. A recently introduced variety of Zinnia available in India is Zinnia Thumbellina, a very dwarfy variety with double flowers of various colours and is reported to be resistant to heat, insects and diseases. This is a good variety for growing in pots. In the plains Zinnias are often susceptible to the virus disease, leaf curl. However, *Zinnia linearis*,-*Z haageana* and the varieties Persian Carpet, Lilliput etc., are quite resistant to this disease.

Bougainvilleas will bloom in summer in North India. These plants should be pruned in June after they finish their flowering to obtain quality blooms later. The variegated bougainvilleas, mostly evolved and introduced by the Lalbagh Botanical Garden, Bangalore, have now become quite popular in our gardens. The other new type of bougainvilleas is the multibracted varieties, introduced from the Philippines by the Lalbagh Botanical Garden, Bangalore. Two such multibracted varieties are B. Mahara and B. Roseville's Delight.

The best time for planning a new lawn, is during May-June. The ground should be dug up to a depth of 1½ feet and the soil allowed to weather after removing weeds from it. In June the ground should be levelled.

The canna beds may be dug up and manured. These may be kept ready for replanting in July. The foliage plants like crotons, palms, ferns, dracaena, differenbachia and other shade-loving plants should be shifted to shade where they can be protected from the hot winds.

Cuttings of shrubs such as Hamiltonia, Poninsettia, Holmskioldia, Aclyhpha etc. may be inserted during April-May. Seeds of Cassia, Bauhinia, Acacia and other ornamental trees can be sown in the latter half of June.

THE KITCHEN GARDEN

In the kitchen garden, seeds of lady's finger, bittergourd, bottle gourd, sponge and ridge gourds, snake gourd, cucumber, pumpkin, amaranthus and cowpeas may be sown during April-May. In the last week of June, seeds of early cauliflower and chillies may be sown. The propagation of mangoes by inarching and of litchi by layering of gooties may be continued during April-May. The fruit trees in general will require copious and frequent watering during summer.

Horticultural Abstracts

Abstracted by
P.C. BOSE

I TROPICAL FRUITS

JAUHARI, O.S., S. DUBEY, AND AYODHYA PRASAD

Effect of 2, 4, 5-trichlorophenoxyacetic acid on the fruit set, development, ripening and qualiy of loquat (Eriobotrya japonica Lindl.) variety Golden yellow.

Agra. Univ. Jour. Res,Sci. **11** (3) : 201 :205 illus. 1962.

Blossoms were sprayed with 5,10,25 and 50 p.p.m. of 2, 4, 5-T. Five and 10 p.p.m increased fruit set over the control; 50 p.p.m hastened the maturity of the fruits by 10 days. Considerable increase in fruit size, mean fruit weight and pulp weight per fruit were obtained with 25 and 50 p.p.m. Treated fruits also showed an increase in ascorbic acid content.

THAPAR, A.R. AND J.P. PANWAR

Studies on side veneer Grafting of Mango.

Himachal Horticulture, **4** (2, 3) : 1-8; April-Sept., 1963.

A detailed description of the investigations carried out to determine the suitability, optimum time for operation and varietal response to veneer grafting of mango at Sub-Tropical Fruit Research Station, Dhaulakuan, over a period of two years, i.e., 1961 and 1962 is given.

FIGUEROA ESCOBAR, ALVARO

(Univ. Ovac. Colombia, Palmira, Cauca, Columbia)

Some aspects of banana fertilization.

Acta Agron. (Colombia) **12** (1/2) : 125-139. illus. 1962.

Nitrogen, P and K were used singly and in various combinations on different plots. There were no consistent benefits from any of the elements used alone or from the several combinations, either in number or size of bunches.

II SUB-TROPICAL FRUITS

SINGH, R.N., P.K. MAJUMDER AND D.K. SHARMA

Seasonal variation in the sex expression of Papaya (Carica papaya L.)

Indian Jour. Agric. Sci., **33** (4) : 261-267; *Dec*; 1963.

A large number of hermaphrodite, pure male, reversing male (fruit bearing type) anal mutilated pure male payaya trees were selected and monthly observations on different sex forms were recorded.

It was observed that the beginning of winter the hermaphrodite trees entered the female-sterility phase and this continued throughout the winter season. The female fertility was restored during summer season, when temperature was very high and humidity low. The pattern of sex reversal was same for all the plants observed.

In sex reversing male trees, the pattern of reversal was similar to that of hermaphrodite trees except that the female fertile phase was very short.

The pure male trees which are mutilated did not exhibit any female fertility during the course of continual year round observations.

The possible causes of modification of sex expression in papaya have been discussed in the light of temperature, humidity and photoperiodicity. The probable explanations of these changes have also been advanced.

KANWAR, J.S., D.R. DHINGRA AND N.S. BANDHAWA

Chemical Composition of Healthy and Chlorotic leaves of citrus plants in the Punjab.

Indian Jour. Agric. Sci., **33** (4) : 268-271; Dec., 1963.

Seventy samples of healthy and chlorotic citrus leaves collected from all over the Punjab were analysed for N.P.K. Ca., Mg., Cu., Mn., Zn and Fe. The results show that the contents of N, Ca. and Mg. in healthy leaves is invariably higher than in unhealthy leaves. The difference is significant in the case of N and Ca. and not significant in the case of Mg.

The content of P and K is significantly higher in chlorotic leaves, and zinc is significantly lower than in healthy leaves of citrus all over the state. If the average content of zinc in one-year old citrus leaves falls below 16.93 ± 1.92 p.p.m; there is evidence of zinc deficiency.

III TEMPERATE FRUITS

BATRA, SHANTI, CHARLOTTE PRATT AND JOHN EINSET

Chromosome Numbers of Apple varieties and sports IV.

Proc. Am. Soc. Hort. Sci. **82** : 56-63; June, 1963.

Apple varieties examined cytologically include 92 diploids, 8 triploids, tetraploid and 10 diploid-tetraploid chimeras. Three varieties reported to have aneuploid or variable chromosome numbers were found to be euploid. The tetraploid variety probably arose as a bud sport. Techniques for counting chromosomes and literature since 1951 are briefly presented.

TITUS JOHN S., AND N.S. GHOSHEH

Some varietal and stock-scion effects on the cation distribution in Jonared and Golden Delicious apple trees.

Proc. Am. Soc. Hort. Sci. **82** : 35-44; June, 1963.

Leaf samples collected from adjacent blocks of Golden Delicious and Jonathan apple varieties in 2 locations in *Illinois* were found to differ in leaf K content. A randomized block experiment involving single budded, double budded and reciprocally budded trees of the Golden Delicious and Jonared varieties confirmed the field observation and indicated that the per cent Ca. in the leaves also differed with variety. However, the total accumulation of K and Ca. in the leaves of the 2 varieties was similar. Leaf Mg. values, expressed both as per cent dry weight and total recovered, were comparable for the two varieties.

The presence of a bud-union had no significant effect on the total accumulation of K or Mg. in the leaves of either variety. Total Ca. accumulation was reduced in the leaves of both varieties by the presence of a second bud-union.

The influence of a body-stock variety was reflected in the higher concentration of leaf Ca. in Golden Delicious trees rebudded to that variety in contrast to the lowered Ca. values of Golden Delicious leaves developing from a bud grafted to a Jonared body-stock. The consistently higher total K, Ca. and Mg. values of leaves of both varieties collected from trees with the Jonared body-stock reflected the greater dry weight of leaves produced when Jonared was used as a body-stock.

Bark and wood composition was also influenced by scion variety, the presence of a second bud-union and body-stock used.

ROSS, R.G. AND R.P. LONGLEY

Effect of fungicides on McIntosh Apple trees.

Canadian Journal of Plant Science, **43** (4) : 497-502; Oct., 1963.

A 4-year test was carried out on the effect of sprays of captan, dodine, dichlone and phenyl mercury acetatate-captan on the performance of mature McIntosh apple trees. Increase in yield of the same trees over the average yield of the previous 5 years were 40,31,18 and 7 per cent respectively, for captan, dodine, mercury-captan and dichlone. The fungicides had little effect on bloom, tree growth as measured by increase in trunk cross-section, and per cent fruit colour. Mercury-captan produced large apples indicating a thinning effect.

The captan sprays produced in most attractive apples with dichlone, fruit finish was rough. Dodine injured about 3% of the apples in 2 years of the test. Dodine gave the best control of apple scab (venturia inaequalis). Dichlone was very effective for early fruit scab.

IV. MISCELLANEOUS

454. AJUJA, K.G., CARPENTER W.J. AND MITCHELL H.L.

Identification of the Anthocyanin in Petal of Rose Cultivars Pink Coronet and Happiness.

Proc. Am. Soc. Hort. Sci., **82** : 562-65; 1963.

The method described by Bate-Smith for the chromatographic identification of the anthocyanidins was employed to identify the anthocyanidin from the petal of roses 'Pink Coronet' and 'Happiness'. Rf values obtained with Forestal and formic acid solvents were compared with Rf values of authentic compounds and the compound tentatively identified as cyanidin. Confirmation of the identity was made by determining maximum absorption values of acidic methyl and ethyl alcohol elvents of the chromatograms. The glycoside was identified as cyanidin.—3.5-diglucoside by Co-Chromatography with the anthocyanin of Better Times rose and by chromatographic identification of the sugar moiety as glucose.

455. LINDQUIST, C.H., GROVER R. AND CRAM W.H.

Studies on Winter Desiccation of Colorado Spruce Seedlings.

Pro. Am. Soc. Hort. Sci., **82** : 602-605; 1963.

Winter transpiration rates were determined on colorado spruce under 3 sets of conditions and the survival of these plants in the ensuing spring was recorded. Some of the plants were kept in frozen soil with or without a snow cover and the others in soil maintained throughout the winter at 65°F, without a snow cover. Winter air temperatures ranged from 5° to 37° F. while light intensities varied from 500 fc 15 10,000 fc. Two-years-old plants continued to transpire under sub-zero conditions. Rates of transpiration increased with increases in either the air temperature or light intensity or both. Higher rates of transpiration were found in plants at 65° F. soil temperature. No winter desiccation damage was observed in plants in frozen soil with a snow cover. On the other hand 83% and 15% survival of plants was observed in plants without snow cover but in frozen soil and soil maintained at 65° F. respectively. Terminal buds were adversely affected also. Only 22% and 5% of plants in frozen and warm soil respectively without snow cover had regeneration of terminal buds compared to 100% survival of terminal buds in plants in frozen soil with snow cover.

456. HARTMAN, JOHN D., ISENBERG F.M. AND JAN KEE ANG

New applications of the Shear Press in measuring texture in vegetables and vegetable products. I. Modifications and attachments to increase the versatality and accuracy of the press.

Proc. Am. Soc. Hort. Sci., **82** : 865-76; 1963.

Very many of the textural qualities that human beings can experience in consuming vegetables or vegetable products can be measured objectively with the shear press attachments described; also some mechanical properties which are not ordinarily sensed but which are nevertheless important are equally susceptible to measurement. Among the latter may be mentioned the overall hardness of onion bulbs from one side to another and the average hardness of a pint of peas.

It is obvious that the shear press, with its various attachments, can also be applied to the measurement of important textural properties of foods other than vegetables and vegetable products and of relatively soft or easily torn non-food items.

457. HOWARD, GENE S. AND HILDRETH, A.C.

Induction of callus tissue on Apple Grafts prior to field planting and its growth effects.

Proc. Amr. Soc Hort. Sci., **82** : 11-15; 1963.

This study presents further evidence that callus formation, and hence healing, an apple grafts may be promoted by moderate temperature during graft storage without forcing scion-bud growth. Scion buds will remain dormant during this warm period of healing if the scion wood is gathered early in the fall before cold weather breaks dormancy. Scions of varieties such as McIntosh, having a low chilling requirement, should be gathered before frost occurs in the fall.

Storage after grafting for 30 days at 70° F. at high humidity resulted in heavier callus formation in the graft and higher scion survival after planting than any of other treatments. This method of healing followed by very cool storage to break dormancy and to hold back bud growth may be of value to nursery men who propagate apple trees by grafting in areas characterized in same spring planting seasons by periods of drought and low humidity.

458. HARTMANN, HUDSON T., WILLIAM H. GRIGGS AND CARL J. HANSEN

Propagation of own-rooted old Home and Bartlett Pears to produce Trees Resistant to pear decline.

A practical method of propagating Bartlett on clonal old Home roots and Bartlett on its own roots is needed to produce pear trees resistant to decline. Studies were conducted on methods of propagating both old Home and Partlett pear by leafy soft wood cuttings under intermittent mist and by hard wood cuttings in the nursery.

Almost 100% rooting of old Home pear soft wood cuttings was obtained if they were taken in early summer, treated with IBA at 6,000 p.p.m. by the concentrated dip method, and rooted under intermittent mist.

Hard wood cuttings of old Home were rooted upto 72% if the cuttings were taken in late October and the bases were soaked in IBA at 100 p.p.m. for 24 hours followed by a storage treatment in slightly moist peat moss at 70° F. for about 3 weeks, and then planted in the nursery row.

Bartlett pear soft wood cuttings were rooted under intermittent mist in the green house. Best rooting was obtained when the cuttings were treated with relatively high concentrations of IBA—8,000 to 10,000 p.p.m. Rooting was obtained when cuttings were taken from either container-grown, green house forced trees, or from orchard trees.

459. ISIKAWA, SIGEO

Light sensitivity against the Germination III. Studies on various partial processes in light sensitive seeds.

Japanese Journal of Botany, **18** (1) : 105-132; 1962.

After the comprehensive studies on the effects of irradiation and temperature treatments on germination of many plant seeds, the author classified the light sensitive seeds into the following five groups according to various partial processes in germination.

A. Dark seeds (Light-inhibited seeds).
   (1) Rhaphanus type: In the seeds of this type, e.g., of Rhaphanus sativus, germination is promoted in the continuous darkness and inhibited by a long far-red irradiation.
   (2) Nigella type: This type has two opposite responses to light; in the case of a short pre-soaking time (Dp : 12-18 hrs.) weak light intensity promotes the seed germination and in a long pre-soaking time. (Dp : 36 hrs.) a strong intensity of light inhibits it. In addition to the light responses, there is also a high temperature response.

B. Light seeds (Light-favoured seeds).
   (3) Short-irradiation type (e.g., *Lysimachia mauritiana*) : Extremely short period of irradiation gives the complete germination of seeds.
   (4) Intermittent-irradiation type (e.g., *Epilobium cephalostigma*) : Intermittent short irradiations induce as much as the germination percentages that are brought by a continuous long irradiation. It is necessary, even in case of a long irradiation, to be followed by a dark period as a post-response for better germination.
   (5) Long-irradiation type (e.g., *Hypericum japonicum* forma *yabei*) : Continuous long irradiation promotes germination. No promotive effect of inter-

mittent irradiation was observed: that is, there needs no dark period as a post-response. Accordingly, in case the dark period directly after the irradiation is controlled at 0°C, promotive effect of light upon germination never lessens.

457. GREIG, J.K. AND AHMED S. AL-TIKRITI

N-Meta—Tolylphthalamic acid and light intensity effects on Transplanted Green-house Grown Tomatoes.

Proc. Am. Soc. Hort. Sci., **82** : 420-27; 1963.

In general propagation frames transmitting different light intensities did not influence number of blossoms formed on tomato plants in the study reported. One application of 175 p.p.m. N-meta-tolylphthalamic acid increased the number of flowers in the first cluster. A second application of 82.5 p.p.m. further increased the number of blossoms in the first cluster. Two applications of the growth regulator, as applied in these studies, increased the number of flowers in the third cluster, particularly on transplants grown under glass or clear plastic propagating frames that transmitted high light intensities.

Yield of marketable fruit was not influenced by application of the growth regulator or by propagation frames used for growing transplants. Apparently tomato plants used in these studies recovered from the initial treatments when they were transplanted in a ground bed in a green house. However, some vegetative characteristics were influenced by N-meta-tolylphthalamic and the different propagating frames.

458. RUMSEY, ANTHONY E.

The Interaction of Temperature Treatment and Moisture Content on Subsequent Germination of Tomato Seed.

Proc. Am. Soc. Hort. Sci., **82** : 446-453; 1963.

Fresh tomato seed was dried at various temperatures. Two-year-old stored seed was adjusted to a range of moisture contents and exposed to various temperatures for upto 240 minutes.

The critical temperature at which heat injured the seed was about 50°C when the seed contained 40% or more moisture.

Total germination and rate of germination were affected adversely by increasing temperatures, time of exposure to those temperatures, and higher seed moisture contents when total germination alone was considered, these effects influenced each other with one exception; namely time of exposure and moisture content. Temperature treatment and moisture content influenced each other when both total germination and rate of germination were considered.

The interaction of moisture content and temperature was significant in the range of 50° to 70°C, inclusive, when seed of germination was considered, whereas for total germination the interaction was significant between 55° and 75° C, inclusive.

The interactive effect was such that seeds of different moisture content, varied in their ability to withstand different temperature treatments.

459. ODLAND, M.L. AND GROFF. D.W.

Linkage of vine type and geotropic response with sex forms in Cucumbers *Cucumis sativus* **L.**

Proc. Am. Soc. Hort. Sci., **82** : 358-369; 1963.

The genotypes of the 4 sex forms found in cucumbers are: gynoecious Acr Acr GG. monoecious acr acr GG. hermaphroditic ACR Acr gg. and andromonoecious is acr, acr. gg. Gene Acr when present with G. causes the initiation of pistillate flowers to begin at the basal nodes. When Acr is present with g. it causes the initiation of perfect flowers at the basal nodes. Plants producing pistillate flowers are conditioned by allele G. Recessive allele g. conditions plants producing perfect flowers.

Positive geotropic response of the peduncle (pendent, peduncle), NN, is dominant to negative geotropic response of the peduncle (upright peduncle), nn.

Gene G was found to be linked with gene N. The coupling phase recombination value was found to be 12.3% in repulsion it was 14.6%.

A new determinate vine type was isolated. The difference between the vine types, indeterminate and determinate appears to be dependent on a single gene. The former, De. is dominant to determinate de.

The gene De is linked with the gene Acr. Data from the coupling phase gave a recombination value of 7.3%.

460. SRINIVASAN K.M. AND HAMNER C.L.

Influence of foliar sprays of Maleic Hydrazide (MH) on fruit set in Tomato under high night temperature.

South Indian Horticulture **10** (1 to 4) : 35-37; 1962.

It was observed that under high night temperature, than are optimal, fewer flowers, heavy abscission and poor fruit-set will result in tomato. Under such unfavourable condition, it was noted that foliar sprays of MH could contribute to better set than are normally possible. The crux of the fruit-set problem in tomato under high night temperatures lies in the availability and utilisation of carbohydrates. Hence it would appear that foliar sprays of MH could have possibly contributed to increase of fruit set by favouring accumulation and better utilisation of carbohydrates.

Since application of growth regulators to individual flowers in addition to providing foliar sprays of MH, further increased fruit-set, it is reasonable to surmise that besides lack of availability of carbohydrates and their proper utilization, difficulty in pollination is also experienced under high night temperature in tomato. That lack of CHO (Carbohydrates) itself can result in pollen sterility in tomato has been reported. It is also known that application of growth regulators would improve fruit-set in tomato where difficulty in pollination exists.

Whatever might be the reasons for the increased fruit-set observed, one thing is clear that a growth inhibitor like MH which can retard respiration and favour accumulation of carbohydrates deserves attention as a chemical that could be used for counteracting unfavourable influences of environmental factors, as for example, high night temperature.

HAWORTH, F.

The effect of different primary cultivations and manurial treatments on the yield of early peas, spring cabbage, leeks and Brussels sprouts. *Jour. Hort. Sci.*, **38** (3) : 199-213; July 1963.

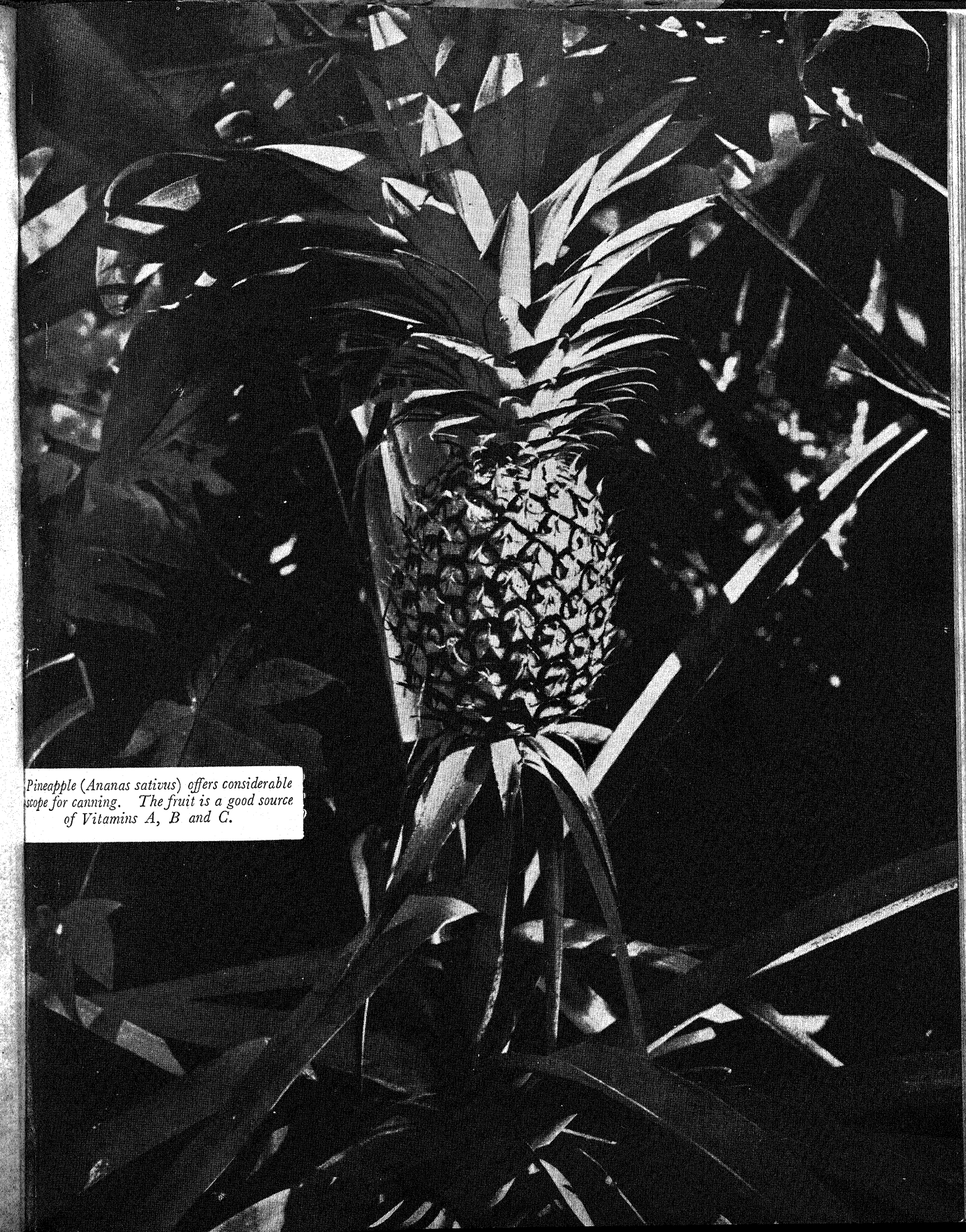
The cultivation treatments consisted of deep ploughing, shallow ploughing-with-subsoiling, shallow ploughing, and shallow rotary cultivation, and these were combined factorially with three manurial treatments. Each of the crops in the rotation was grown in each year from 1954 to 1959. Special attention was paid to weed control and the experimental area was kept essentially free from weeds.

On average, the differences between the yields from the three ploughing treatments were small but, although the largest mean difference was only about 7% several of the differences were significant.

The ploughing treatments gave significantly higher yields of all four crops than did shallow rotary cultivation; the mean difference varied from 11% for peas and Brussels sprouts to almost 40% for spring cabbage.

Farmyard manure (FYM) with NPK fertilizers gave substantially higher yields of leeks, spring cabbage and Brussels sprouts than nitrogenous fertilizer alone, but a smaller increase of only 18% in the yield of peas.

The following significant interactions are discussed: cultivation × years, menurial treatments × years, cultivations × manurial treatments and, for leeks only, cultivations × manurial trratments × years. It is concluded that the effects of some of the experiments treatments on the water available to the plan roots were, at least in part, responsible for some of the significant differences and interactions.



Pineapple (Ananas sativus) offers considerable scope for canning. The fruit is a good source of Vitamins A, B and C.

VOL. 662 EVEREST

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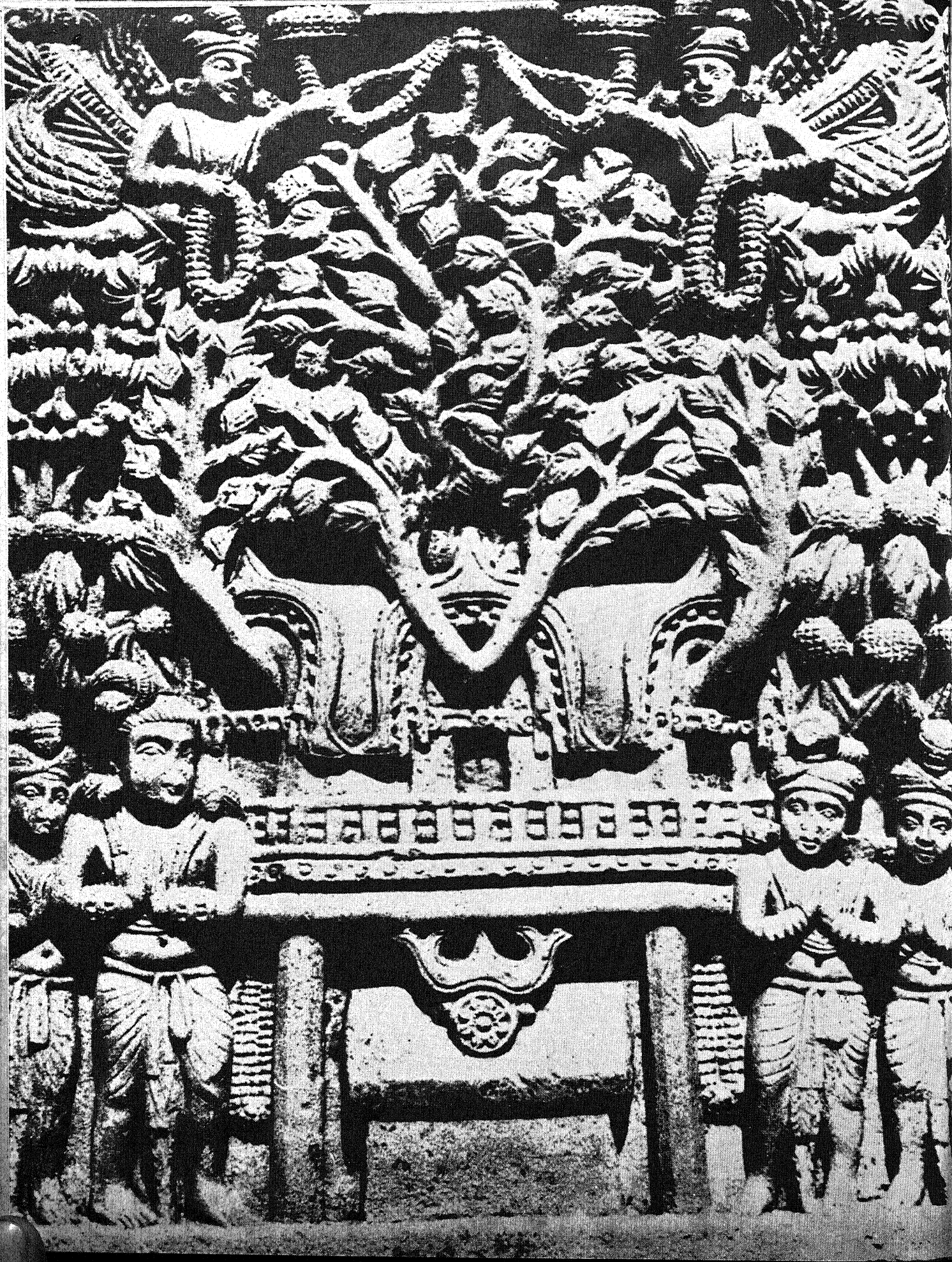

Indian HORTICULTURE

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Contents

OUR COVER

The Phalsa (Grewia asiatica). Its fruit, leaves and root bark—all are valued for their medicinal properties. Phalsa fruit, both raw and processed is highly relished.

Photo: **Gurcharan Singh**

Editor: **P.L. Jaiswal**
Assistant Editor: **M.V. Narayana Rao**

←Facing Photo
Horticulture in sculpture:
Monks worshipping the Bodhi *tree–Sanchi*

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INDIAN COUNCIL OF AGRICULTURAL RESEARCH, NEW DELHI

Editor's Page

PROGENY ORCHARD-CUM-NURSERIES

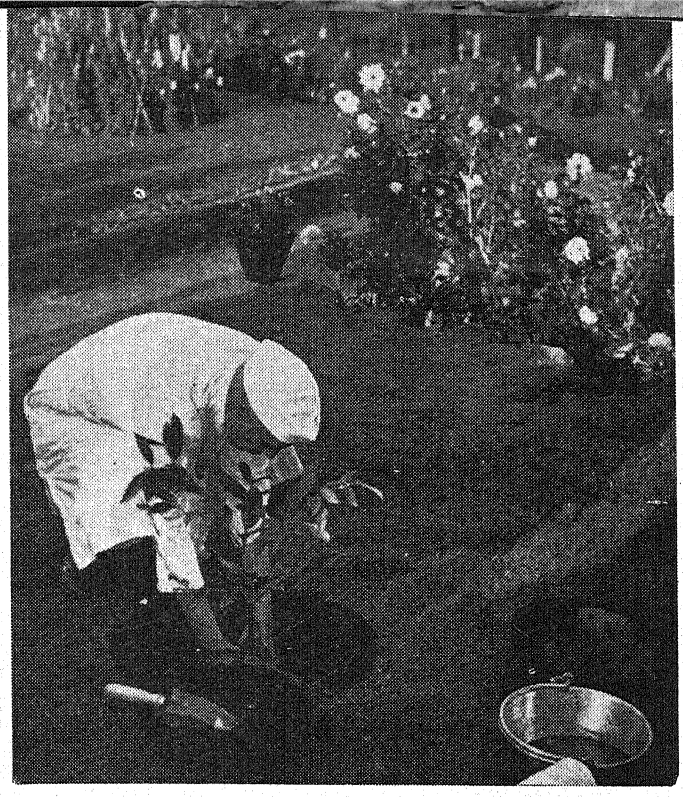
Nowhere do the idioms "like father, like son" or "a chip of the old block" fit in more admirably than in the vegetative propagation of fruit trees. For the 'chip' to be healthy, the 'block' must also be healthy. Thus, the progeny orchards play an important role in fruit development in that they stock genuine and healthy pedigree trees. Selected clones are tested for their performance and regional adaptation in these orchards. A well-tested clone has an important bearing on the longevity of orchard trees as well as on yields. The best clone for an orchardist is as important a factor in determining the success of orcharding as the nature of the soil, climate and other factors.

Fruit trees are as good as factories producing commodities for human use; but, while methods of production can quickly be changed and better results obtained in a manufactory, trees take years to produce, and faults in their rearing may prove irreparable. If nursery plants are propagated from inherently low yielding progenies, no amount of aftercare in the form of cultivation, fertilizer applications and other cultural treatments would make them profitable. The loss, consequently, in time, money and energy will be colossal. The orchard trees used for nursery production should be outstanding in productivity and fruit quality. But such trees are rare and have to be carefully selected by recording their orchard performance over a number of years. After having selected them, the nursery plants propagated from these outstanding trees could be expected to yield bumper crops of quality fruit.

It is with this objective that a scheme for the establishment of progeny orchard-cum-nurseries, has been launched as a 3rd Five Year Plan Scheme. The progeny-orchard-cum-nurseries, according to the scheme aim at: (i) stocking fruit trees of such as have given outstanding performance; (ii) keeping performance records of the trees growing in the progeny orchards; (iii) supplying bud wood for raising adequate number of pedigree nursery plants in the nursery attached to it; and (iv) raising suitable stock material to furnish standardised rootstock material in adequate quantity to all nurseries.

In addition, the progeny orchard-cum-nurseries would also survey and collect promising juicy mango seedlings having desirable features for further perpetuation. This work is, however, restricted to only six States, viz., West Bengal, Bihar, Andhra Pradesh, Punjab, U.P., and Madhya Pradesh.

The present position regarding the supply of nursery plants of reliable parentage and guaranteed performance is most adequate to meet the growing demands of the expanding fruit industry. Many states and centrally administered areas do not have any arrangements for the production of nursery plants for supply to the fruit growers. These states are dependent on Government nurseries. The need, therefore, to augment supplies of known and guaranteed fruit plant materials for stepping up fruit production in the country, is acute. Intensifying the scheme of establishing progeny orchard-cum-nurseries, and extending it to cover all the States is the only answer to this need.



Shri Nehru planting a seedling

flowers, indigenous and exotic. The hills, the rivers, the snow and the wild flowering trees fascinated him as nothing else did. He was 'a lover of the meadows and the woods and mountains, and of all that we behold from this green earth.'

It is an old controversy whether the time-spirit makes the significant men, or the men awaken the spirit of the time. In the case of Nehru, it is clearer than crystal that he awoke the spirit of the time and galvanised his people into action. His words reverberate throughout the length and breadth of the country: "India is on the move and the old order passes. The initiative comes to our people now and we shall make the history of our choice. Let us all join in this mighty task and make India, the pride of our heart, great among nations, foremost in the arts of peace and progress. The door is open and destiny beckons to all."

He was the hope of millions and the saviour of many. 'There hath past away a glory from the earth' and history may not repeat itself.

He lives

In leaves, in clouds,

In waves, and in every

peace-loving soul

"The woods are lovely, dark and deep

But I have promises to keep,

And miles to go before I sleep

And miles to go before I sleep"

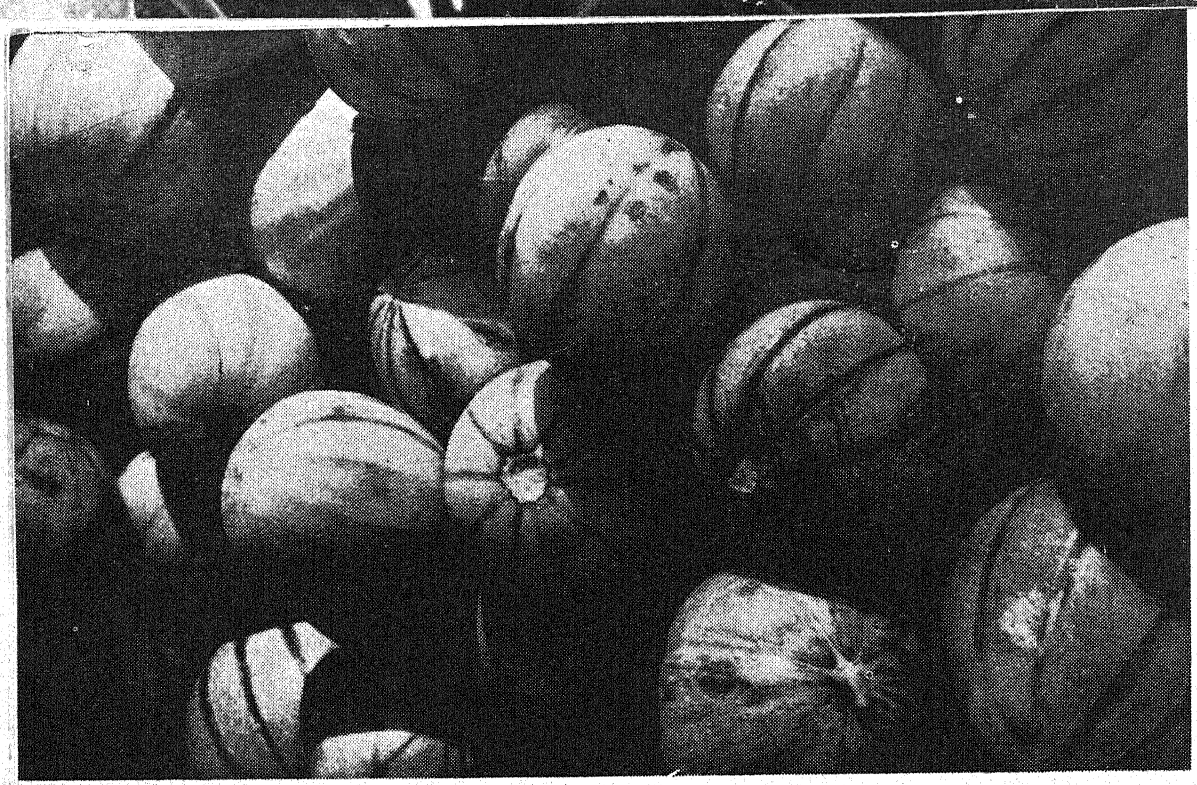
The Light Passes Away

Mysterious are the ways of Destiny. Those who by their deeds endear themselves to the people are snatched away from our midst. As a man, as a statesman and as a leader of the nation, it is difficult to find in Indian history any other personality that reached the height Shri Nehru attained.

He loved his country and he loved freedom. His affection for children and his passion for trees and flowers are by themselves a saga. He was so much attached to the beautiful roses that he could never be found without a rose in his button-hole. The rosery in his garden was the home of unnumbered varieties of sparkling

Roses in plenty at Shri Nehru's residence

Photo: P. S. GOPAL



Delicious musk-melon fruits fresh from the field

Rajasthan Revels in

Musk-Melon Cultivation

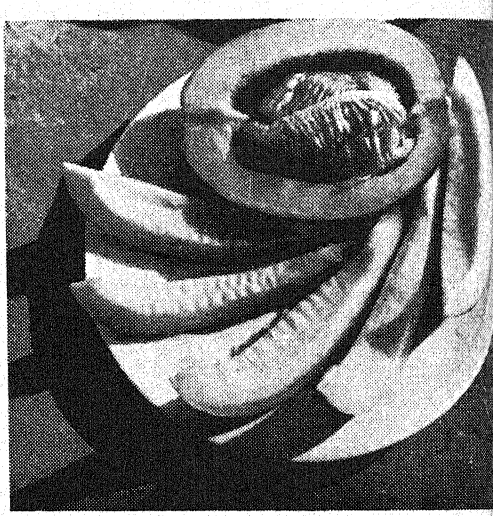
O.P. MATHUR AND B.N. MATHUR

MUSK-MELON (*Cucumis melo*) commonly known as *kharbuza* is a highly relished fruit in Northern India. It is a good source of vitamins, A, B and C. Large areas of river beds of Banas in Tonk district and many others in Rajasthan are covered with musk-melon. Musk-melon fruit particularly from Banas river beds is famous for its pleasant flavour, sweetness and keeping quality. The thick-skinned sweet types are transported to large consuming centres. They fetch good price in the market making its cultivation highly profitable.

Musk-melon is a warm season crop. Hot and dry weather conditions at fruiting stage favour ripening, development of sweetness, good flavour and solidity of fruit. Cloudy and rainy weather not only impairs the quality of fruit but also makes the crop more susceptible to diseases and pests.

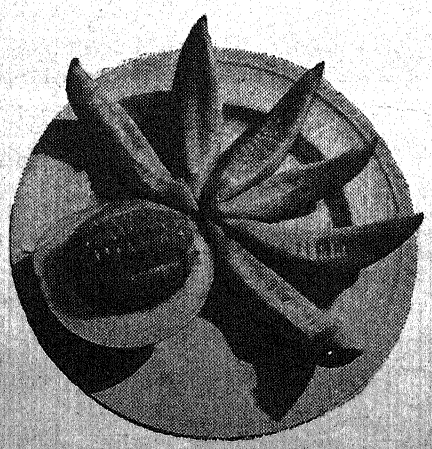
BANAS RIVER BEDS

The soil and moisture conditions of Banas river beds are much different from normally cultivated fields. Soil mostly comprises coarse sand varying from 0.5 to 2.00 m.m. in size and having almost negligible quantity of organic matter and other food material. There is a thin stream of water flowing in the river throughout the crop period. Water of this stream is capable of moving laterally below the surface of the soil because of bigger pores. Thus a continuous and regular supply of water to the crop sown in the river beds at the same level of stream is maintained and the botheration of lifting water from the stream and then irrigating the crop is avoided. The root formation under coarse sand conditions is more extensive



Musk-melon slices, from ripe fruits

Photos: KAMLA GULHATI



due to which there is greater absorption of moisture and nutrients. These appear to be the two main advantages which have encouraged the cultivation of musk-melon in Banas river beds extended over vast tracts.

VARIETIES

Many types with white, green and cream-coloured fruit skin, white-cream and greenish-white flesh are grown. Similarly, both smooth skinned and netted types are found. Musk-melon of Tonk can broadly be grouped into *Mitha* and *Phika* types on the basis of sweetness. Some of the important *Mitha* varieties grown are Motia, Sharda, Safed Gola, Hara Golas and Batia. Among the *Phika* varieties are Kharda and Dhola Phika. Excepting Batia which gives small-sized, thin-skinned fruits, all other varieties are thick skinned and produce medium to large-sized fruits. Phika varieties start giving fruits about a fortnight earlier and also yield more than Mitha ones. It may be pointed out here that maintenance of purity of variety is very difficult in river beds because of the fact that musk-melon is a highly cross-fertilized crop and different varieties of melons are grown in beds close to each other.

CULTIVATION

Sowing time. The sowing of seed is done from December to February. There is always a danger of damage to early sown crop due to frost while the late-sown crop is usually more attacked by pests and diseases.

Field preparations. Unlike normal field preparations where many ploughings, harrowings, etc., are given, only ridges and furrows of 45 to 50 feet length and 5 to 6 feet apart are prepared with the help of a spade. While making ridges and furrows, care is taken that these are near to the stream as far as possible and the base of furrow is in proper condition, *i.e.*, neither too wet nor too dry.

Sowing. Seeds from selected mature fruits of last year's crop are sprouted by keeping in moist gunny cloth pieces and in earthen plots. Sprouting is enhanced by sprinkling hot water and treating with cow-dung. Sprouted seeds @ 2-3 lb. acre are sown 1½ to 2 inches deep in furrows at a distance of one foot from hill to hill. Two seeds are put at each hill to ensure uniform stand. Small quantities of farmyard manure are placed below the seeds at each hill for better germination. Germination takes place after 5 to 6 days of sowing.

MANURING

Manuring musk-melon under river bed conditions is quite different from that normally adopted. Farmyard manure at the rate of 100 to 150 maunds per acre is applied when properly mixed with large quantities of tank-bed silt brought from outside. In addition to the above, 30 to 50 lb. nitrogen and 20 to 30 lb. phosphoric acid per acre are applied through chemical fertilizers. Manures are applied to the standing crop just in root zone as band placement in two to three instalments at intervals of 15 to 20 days each. About 4" wide and 4" to 8" deep channels are dug on either sides of the row with the help of *kassi* (hand-hoe) for the placement of manures and silt. In case of first manuring, the fertilizers are uniformly placed at the bottom of the aforesaid channels which are then filled with mixture of farmyard manure and silt. For second and third applications, the channels are dug deeper and the fertilizers are embeded in silt and not placed at the bottom like first application. The third manuring which is done at fruit initiation stage with nitrogenous fertilizer and silt only, directly helps in better formation and development of fruits. While digging channels for manuring, some of the roots get pruned which encourages further root formation. The mixture of farmyard manure and silt not only supplies nutrients to the crop but also helps in capillary movement of water and its retention. Thus water is regularly made available to the crop in the active root zone even when level of stream falls down later during the hot season.

INTERCULTURE

Plants are earthed up 3 times at each manuring and furrows get covered into ridges and ridges into furrows. Only one plant is kept at each hill and the rest are thinned after first manuring. Weeds and stones if any, are removed by hand.

A number of fruits per plant are formed but only one or two develop at a time and the rest dry off. The fruits are made available after 90 to 100 days of sowing depending upon variety and weather conditions. Normally a yield of 150 to 200 md. per acre is easily obtained.

PESTS AND DISEASES

Musk-melon crop is severely attacked by pests and diseases. Among the major pests are fruit flies (*Dacus cucurbitae*) and red pumpkin beetle (*Aulacophora foevicollis*). Maggots of fruit flies bore into the fruits which later rot. Beetles feed on the leaves and flowers while grubs bore into roots. To control these pests, pyrethrum products may be used.

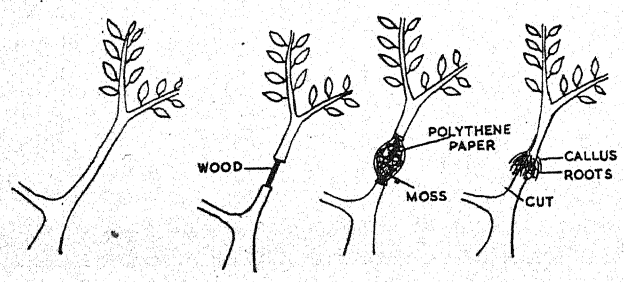
The common diseases of this crop are powdery mildew (*Erysiphe cichoracearum*) and downy mildew (*Pseudoperonospora cubensis*). For the control of powdery mildew, fine sulphur may be dusted or wettable sulphur at 1 lb. in 30 gallons of water may be sprayed in the morning or evening hours to avoid hot sun while for downy mildew spray of 3:3:50 Bordeaux mixture may be used. Spraying of wettable sulphur @ 1 lb. in 30 gallons of water is equally useful for the control of powdery mildew.

about the luscious LITCHI

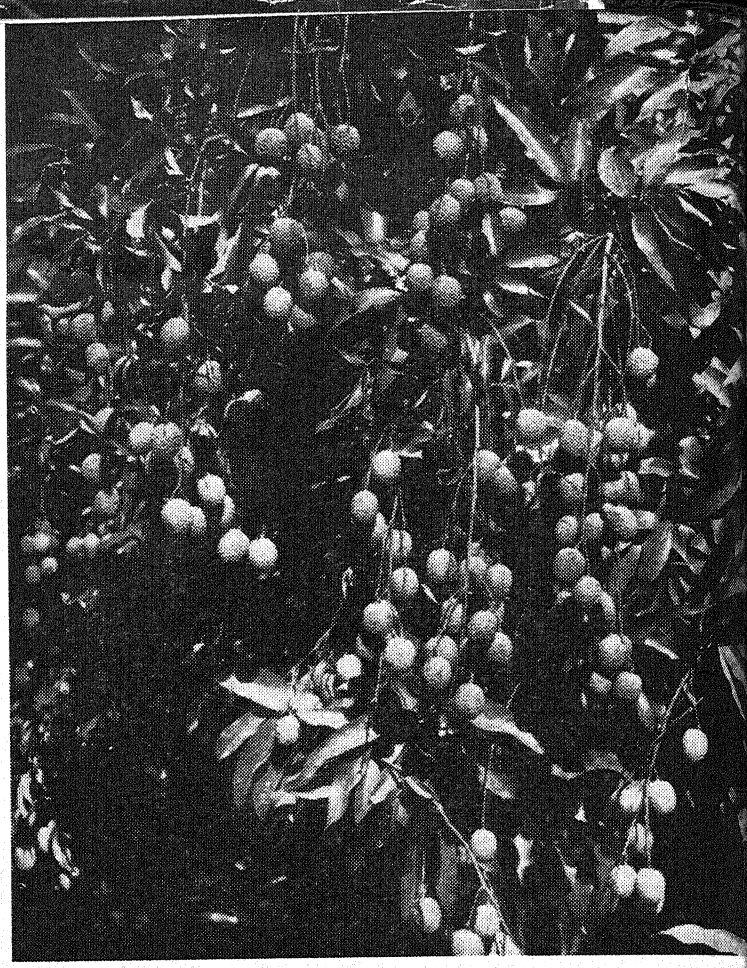
RAJENDRA KUMAR SHUKLA

Litchi (*Litchi chinensis*), one of the most nutritious fruits, is China's gift to subtropical regions. After China, India ranks first in the world in Litchi cultivation. It is extensively grown in Bihar, Bengal and other sub-mountaneous regions of Uttar Pradesh and Punjab. Its growth is spread over an area of more than 30,000 acres. It is highly profitable from a commercial point of view to extend the acreage under litchi and export the fruit to foreign countries. The fruit is very nutritious which is evident from its good value. In the fresh fruit, the flesh constitutes about 70-80% of its weight. It is very sweet and contains ten to 15 per cent soluble sugars and 1.15 per cent proteins. It is a rich source of vitamin C and also contains fair amounts of phosphorous, calcium and iron. Small amounts of vitamins A and B are also present.

Subtropical hopimid climate is best for Litchi cultivation. Frost in winter and hot winds in summer limit the production of fruit. Fruits under the effect of hot winds show up cracks before reaching full maturity. The loss may be minimised by providing suitable wind breaks with *shisham*, bamboo, *Jamun* etc., at the western side of the orchard. Litchi will do well in regions having a rainfall of 40-45 inches, and irrigation will be unnecessary.



Deep loamy soil with good quantity of organic matter is best. Proper drainage ensures better survival of orchard. Soil should be slightly alkaline but it can be grown on slightly acidic soils also. It cannot be grown successfully in soils deficient in lime.



Litchi tree loaded with fruits

PROPAGATION

Air layering has proved to be the most satisfactory method. Plants propagated by seeds will show considerable variation and will be slow in growth. Seedling plants do not bear before ten years. Air layered plants will fruit in the sixth year itself. In air layering, a branch, 1/3" to 3/4" thick is selected, and one inch wide ring of the bark is removed. A mudball (Two parts rotten gunny bag, two parts sand, two parts castor cake and eight parts pond earth) is tied around the place from where the bark has been removed with a piece of gunny bag. This is to be moistened daily till the emergence of roots. An improvement on this technique is to wrap the portion with wet moss and tie it up with polythene paper of 150 gauge thickness.

No watering is required as polythene paper conserves moisture. Roots will emerge after about 60 days and the plant should be detached gardually. Now they should be acclimatised in nursery, and after two months planting can be done.

Planting: The months of July and August are the best period for planting. Pits 3' in diameter and 3' deep at intervals of 30' should be dug in the month of April or May. After exposing the pits for two weeks, they should be filled with mixture of 30 seers of compost, two seers of lime and soils of old litchi orchard.

MANURING

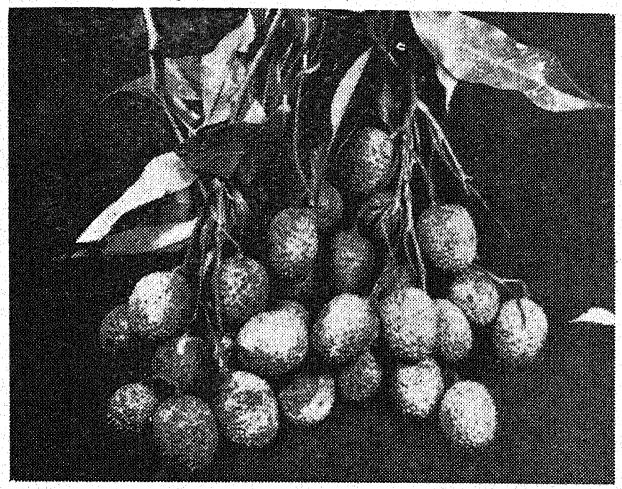
Doses indicated in the following table are applicable to most parts of India.

Manure	First Year	Subsequent increase per year	Maximum Qty.
F.Y.M. or Compost	30 seers	20 seers	110 seers
Wood ash	4 ,,	1½ ,,	10 ,,
Castor or *Neem* cake	2 ,,	2 ,,	10 ,,
Lime	2 ,,	if required	—

Application of two or three pounds of ammonium sulphate will hasten the growth.

Pruning: No pruning is practised in India except removal of a few branches at an early stage to strengthen the frame. During harvesting, it is customary to take 6″ long branch with fruit which ensures new growth and good fruiting next year.

Orchard should be kept free from weeds. In the early stages a distance of 30′ between each two plants



A heavily-leaden bunch of fleshy and juicy fruits

will be advisable as it will facilitate inter-cropping with brinjal, tomato, cauliflower cabbage, knolkhol, *bhendi*, pea, etc.

CONTROL OF PESTS AND DISEASES

Fortunately no serious disease is prevalent in India. Only a few pests are important. Litchi Mite (*Eriophyes* Spp.) causes leaf roll and brownish growth below the leaf. Affected portion should be removed and burnt. Spraying with crude oil emulsion or D.D.T. solution will be effective.

Another pest is Mango Mealy Bug (*Drosica stebbengi*) which sucks sap from flowers and new branches. For efficient control, stem should be banded with "Ostico" or "Grease band".

Fruiting: Flowering occurs 4-6 years after planting. Fruits set during Jan.-Feb., and they ripen during May and June according to varieties. On ripening, fruit develops light red colour. It is proper to harvest at this time.

VARIETIES

There are several varieties grown in different parts of the country. Some of the important varieties are listed below.

For Uttar Pradesh and Madhya Pradesh

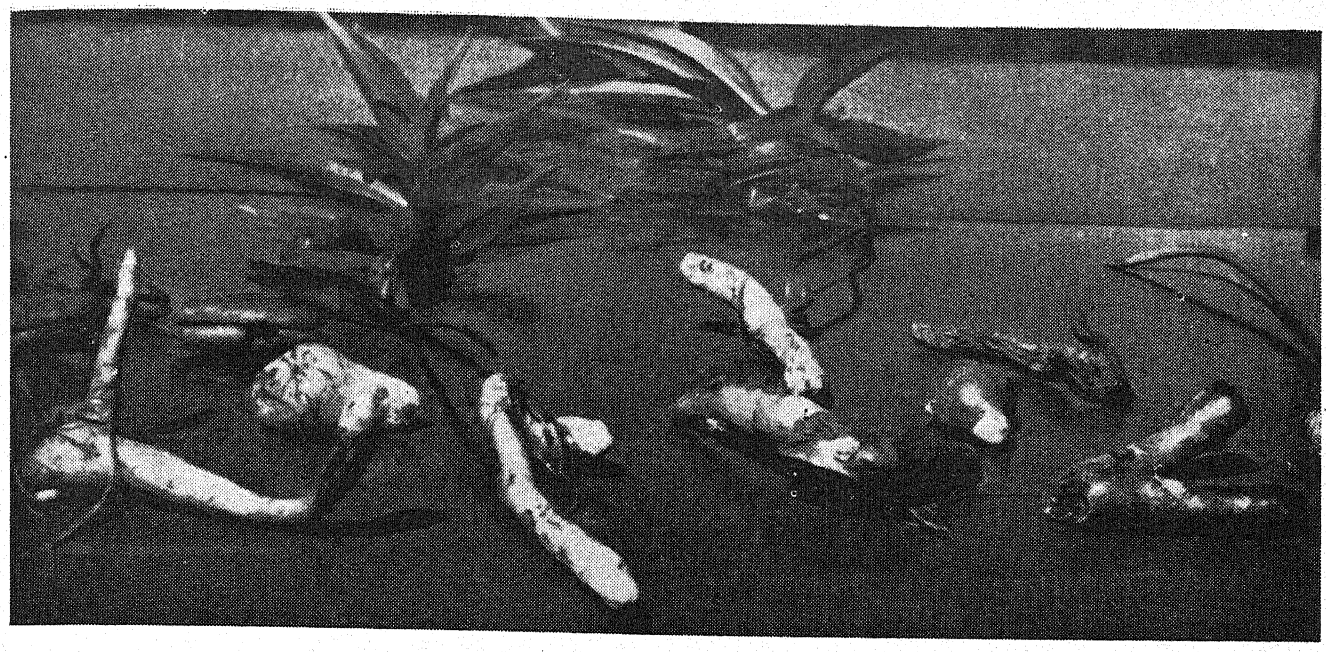
Ripening Season	Varieties
2nd Week of May (Early)	Early large red, carly *bedama*
2nd Week of June (Mid season)	Late large red, rose scented
Late June (Late)	Late *bedana*, *Kalkatia*

Other varieties grown in small amount—Extra early green, Gulabi Saharanpur pickling, Katti, Dehra Dun, Saharanpur piazi.

For Bihar and Bengal

Late April to early May (Early)	*Desi*, *Purbi*, *China*
Mid-May to Early June (Mid season)	*Kasava*, *Bedana*, Early *bedana*, Dehra rose, *Shahi*
Late June (Late)	Late *bedana*

Under ordinary conditions it can be stored for a week but its freshness can be preserved in a cold storage for three months. Fruits can be stored in distilled water for two to three weeks without much loss in quality. It can be stored for three months under cold storage conditions at 30-45°F.



Glory lily tubers: They have good medicinal uses

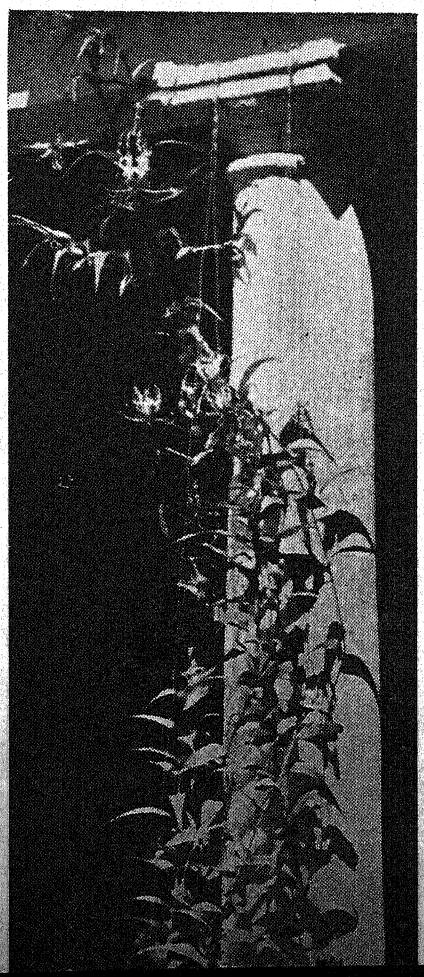
THE GLORY LILY

graceful and elegant

RAMESH BEDI, NEW DELHI

PHOTOS : NARESH BEDI

Glory lily in flower



SIR WILLIAM ROXBURGH once observed, "Glory Lily is one of the most ornamental plants any country can boast of." During the rainy season it is often found shooting up in the hedges of Euphorbia, Lantana, Carnissa or bamboo thickets. The grace of its from, amidst the stout and ugly plants with their fierce thorns and spikes, and the gaiety and warmth of its flowers amidst the sullen and cold gray surroundings, have, no doubt, given cause to the superb name the flower bears, *Gloriosa superba* Linn., which is popularly known as the Glory Lily. The flowers are borne in great profusion from June to October.

Glory Lily is a large glabrous, herbaceous branching climber, with narrow leaves, 15 to 20 cm. long and variable in width, about 3 to 5 cm. across, ending in a spirally twisted climbing tendril. The plant proceeds upwards with the help of these tendril-like tips. It is an excellent climber, restricted in its growth, and does not attain a height more that 20 feet. The herbaceous annual stem dies with the ripening of fruits.

'TIGER-CLAWS'

The flowers, 8 to 10 cm. across, are large, axillary, solitary, and do not wither at all for about seven days. Sepals and petals are 6.3 cm. long and 8 to 13 mm. broad, with strongly crisped, waved margins. They are at first erect and greenish, afterwards becoming reflexed and turning to light yellow at the base, and dark red with yellow margin towards the top; with age they darken in colour, and finally become scarlet to crimson. The curved petals and sepals give the appearance of tiger's claws. Hence, in English, the plant has got its name 'tiger claws'.

The root stock is a chain of fleshy arched, solid, white, large, simple or forked, flattened or cylindrical tubers often 15-20 cm. long.

This climbing jungle lily is found throughout the tropical parts of

India ascending to an altitude of 7,000 feet on the hills. It is common in the forests of Bengal, Uttar Pradesh, Mysore, Madras, Marwar, and Andaman Islands. The distribution of this plant is extended to ceylon, Malayan Peninsula, Cochin, china and tropical Africa, also.

PROPAGATION

It is easily propagated by seeds, but a quicker method is to raise by dividing the vigorous, horizontally growing tubers. While planting old tubers, offsets should be removed and grown separately for the production of new plants. The tubers may be cut into two and each planted separately. After having a rest in the early winter, they are sown in pots or in the ground before the onset of rains in light rich soil with good drainage. It requires a lot of nourishment and therefore a rich compost should be provided. Budding takes place form the convex upper side of the tubers. They should be watered regularly when they start growing.

This jungle plant likes sunny situation and is useful for filling odd corners in a garden. It can successfully be trained to spread in the form of a curtain in front of bungalows, and as a side wall in lawns.

The spectacular claw-shaped yellow and scarlet flowers are excellent for cutting. Although the Glory Lily is commonly grown in gardens in many parts of India, it has not been propagated as a commercial crop. The growers of ornamental plants can undertake its large scale cultivation with profit near big cities. Its rainbow-coloured cut flowers will fetch them a handsome price, in addition to the tubers, which will also find their way in the raw drug market.

USES

Since the flowers are showy and their life span is comparatively larger, they are suited for the lively decoration of drawing rooms, offices, show-rooms display windows, glass pannels etc.

Colchicine, an alkaloid of the tubers, is used in plant breeding work for inducing polyploidy. Experiments on sunhemp (*Crotalaria juscea* Linn.) seedlings have shown that gloriosine also possesses polyploidizing effect and promises to be even more effective than colchicine. The tuber has very important medicinal uses. Colchicine is used chiefly as salicylate in the treatment of gout and rheumatism. The paste of the root is applied for parasitic affections of the skin. In Ceylon, the root is used in the treatment of bruises and sprains. In Persia it is used in the treatment of haemorrhage from the nose.

It Is Easy To Grow

GLADIOLI

The Queen Of Bulbs

U.S. KAICKER AND J.P. NAURIYAL
Regional Fruit Research Station, Mashobra, Simla

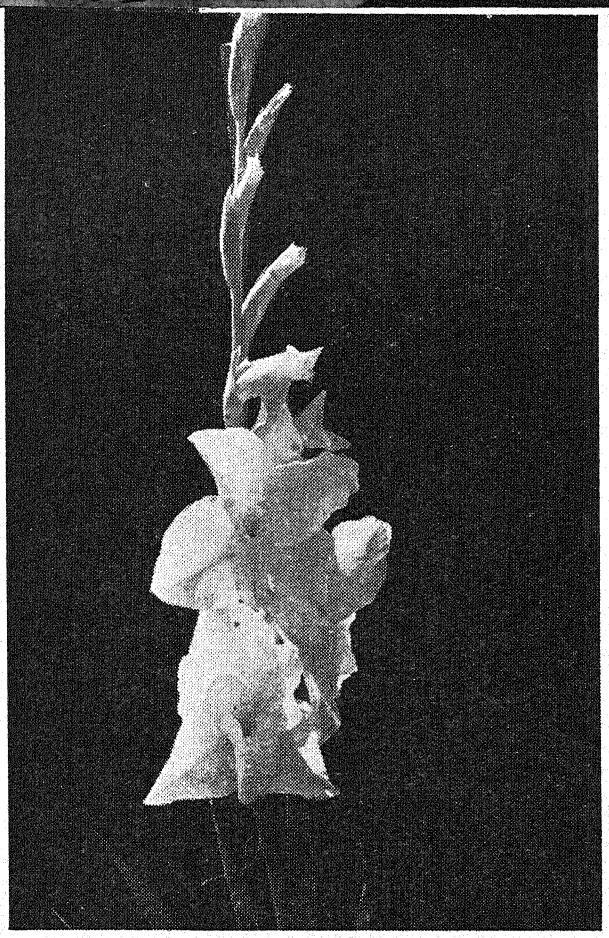
OF the various flowering plants which provide beauty and colour in the hills, gladiolus (*Gladiolus tristis*) easily tops the list and can rightly be called the Queen of bulbs. Any one visiting the hills in the months of July and August is simply fascinated by the variety of form and the riot of colour which the long beautiful spikes of gladiolus scatter around. They provide maximum beauty and grandeur to the garden over a long span of time. The spikes bearing from 18-24 flowers continue blooming for 15-20 days. The ease with which gladiolus can be propagated and the variety of colour which it offers will make it the pride possession of any flower grower.

A PICTURESQUE LANDSCAPE

Out in the garden, gladioli provide a picturesque landscape. Densely planted beds by the side of a lawn and a winding border alongside a path, waving with the summer breeze will catch the heart of any passer by. The spikes which keep well till almost a fortnight are widely used in cut flower trade and are flown over long distances from the site of their production. Gladiolus cultivation offers excellent opportunities to people in hill areas to supplement their income. The agroclimatic conditions in the plains do not permit proper rejuvenation of the corms, and big size blooms are not obtained from the corms produced in the plains. Therefore, they have to depend on growers in the hills for their supplies of suitable corms.

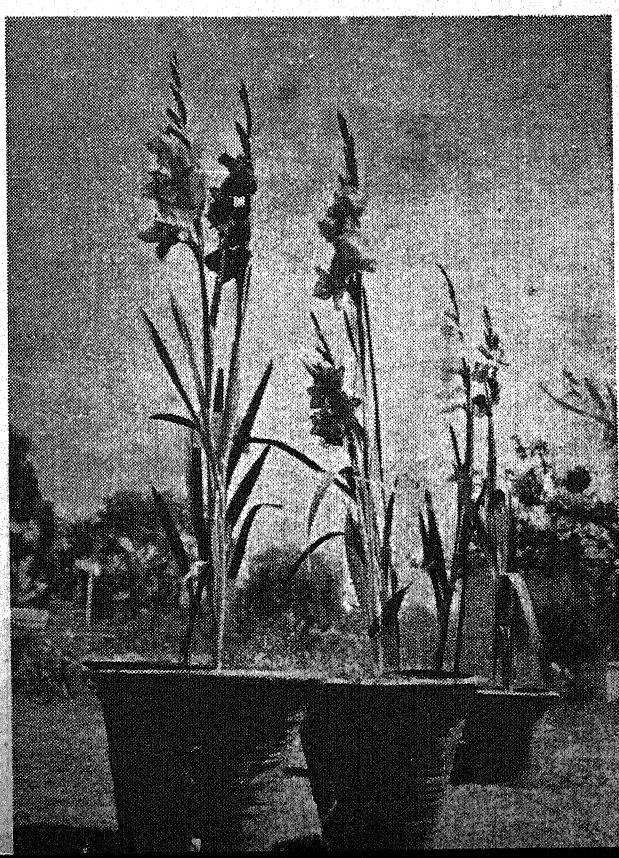
Some work has been done at the Regional Fruit Research Station, Mashobra during the last three years on the cultivation and selection of gladiolus varieties. The following information is based on the observations made on over sixty internationally named varieties of gladioli, as also on a number of unnamed varieties.

Gladioli produce flowers of different sizes and of different types, e.g., single or double, with straight or ruffled petal margins and with a range of colour manifestations—striped, bicoloured and variegated to meet even the most fastidious tastes. In hotter climates, the size of flowers is generally small and growth of corms is also retarded. With suitable precautions, however, even the growers in the plains



Gladiolus flowers—surpassingly beautiful against the dark backdrop

Gladioli plants raised in pots



can expect to get satisfactory bloom. The following points deserve consideration in producing maximum effect of colour and beauty.

LOCATION

The plant does best in sunny situations, and for this reason, planting on southern slopes should be preferred on hills. Densely planted gladioli beds against the background of a green lawn, present a beautiful mass effect. They can also provide colourful effect at the rear of a herbaceous border, in terraces, in rockeries and also in earthen pots placed close together. Locations vulnerable to high winds and continuous draughts of air should be discarded. At such places, a good deal of staking may be necessary.

SOIL

Gladioli do not like heavy clay soils. A rich well-drained sandy loam will give best results. Slightly acidic soil with enough of humus in it is considered best for division of corms and formation of small cormlets. Soils with too much of organic compost should be discarded to avoid rot of bulbs. Sandy soils that do not retain water are also unsuitable.

PREPARATION OF BEDS

Like all other bulbs, gladiolus is susceptible to water stagnation. On the hills, therefore, preparation of raised beds is suggested or else suitable arrangements should be made for the drainage of excess moisture. While making beds, the soil should be thoroughly dug up to at least one foot depth. Four inches thick layer of well rotten and finely powdered farmyard manure and two inches thick layer of sieved leaf-mould should be spread over the soil. The farmyard manure and the leaf mould should then be mixed thoroughly in the soil. In places, where the soil is very heavy and clayey, mixing of two to three inches thick layer of river sand alongwith the farmyard manure may prove beneficial.

For planting the corms in pots, an ideal pot mixture consists of equal parts of sand, loam, farmyard manure and leaf mould. Care should be taken that manure of any kind does not come in direct contact with the corms. Otherwise they will begin to rot. Green manuring of beds with sunhemp, lupins, clovers etc., prior to planting corms, works wonders in enriching the soil and consequently good size corms are obtained.

PLANTING

Gladiolus can be planted in the hills at any time between October and the end of March, the latter date depending upon weather conditions. In the plains, the best time for planting the corms is early October. By doing so, fairly good-sized corms are often obtained and these can be used in the subsequent year. It has been observed that early planting in hills results in the production of a large number of cormlets which are a source of income to commercial nurserymen.

The corms grow up and flower within 90 to 100 days of their planting, and by regulating the planting time one can easily obtain a succession of blooms. To a certain extent the depth at which the corms are planted will also regulate the time of sprouting and subsequently the time of flowering of the plants. The deeper the corms are buried the later they will bloom. Also, the varieties can be chosen for their early or late blooming qualities. Thus it is not at all difficult to obtain a continuous bloom over a period of several months through judicious selection of varieties and planned planting. Prolonged blooming period is good for cut flower trade also.

Gladioli can be raised both from full-sized corms and from the rather small cormlets, produced by the former. The latter, however, may not flower in the same year. Whenever gladioli are to be planted in the border with other herbaceous annuals and perennials, care should be taken that they have a rear place in the border, as they will easily attain a height of 1 to 1½ metres. The large-sized corms should be spaced 10-20 cm. apart. A distance of 30-40 cm. should be kept between the rows. Gladioli can also be planted according to hexagonal method with a view to covering the whole area effectively. The smaller corms should be given lesser spacing of 8-15 cm. Normally the corms should be planted at a depth equal to one and a half times their height.

USE OF CORMLETS

Cormlets can also be planted in 2.5 to 5 cm. deep furrows 10-15 cm. apart in the month of October-November in the hills. Cormlets planted early in the season will sprout earlier, grow better and form larger-sized corms for the next year. Occasionally, they will flower in that very year, but in that case the size of flowers as well as the length of spikes will be smaller. The cormlets should not be buried as deep as the big size corms; they may fail to germinate.

After having planted the corms and cormlets, the bed should be irrigated immediately. This will settle the soil firmly and will induce quick rooting. Some persons plant the corms and leave in beds for producing flowers in the next year. It is desirable, however, to lift the corms and plant them afresh every year. On rockeries and similar other places, gladiolus corms can be left as such for several years.

IRRIGATION

All bulbs including gladioli require good irrigation when in active growth. It is better to irrigate at least twice a week during the dry months of May and June when the corms have sprouted in the hills. In the plains, they will sprout in November-December and the same number of irrigations will be required. No watering is needed on the hills during the months July to October provided there are sufficient rains and the soil is moist.

Irrigation at a time when the plants are dormant should be avoided as this may lead to rot of corms.

Frequent hoeings and weeding should be done from March onwards to keep down the undesirable weeds.

MANURING AND MULCHING

Application of finely ground rotted organic manure to make a five-centimetre-thick layer on the bed is conducive to better growth and flowering. Liquid manure or ammonium sulphate and super phosphate at the rate of two ounces per gallon of water may be applied in May and June. This practice induces better flower and corm formation. Winter mulching which is necessary on the hills, may be done with the help of dried grass, rice husk or fallen dried leaves to protect the bulbs from ground frost injury.

PESTS AND DISEASES

Gladioli grown in hilly regions of the country do not encounter any serious pests and diseases. As all diseases show up in bulbs, detection of healthy bulbs at the time of planting, maintenance of proper garden sanitation and allowing the gladioli plants to put in vigorous growth, will ordinarily keep them free from most diseases and pests. Nevertheless, some insects and diseases which are of importance to commercial growers are mentioned below alongwith suitable control measures.

PESTS

Cut Worm. The tender new shoots of young gladioli are often damaged by the cut-worms, which are nocturnal in habit. Initially the first leaf of the plant is cut and severed off. If the attack continues, the stem may also be cut away thereby rendering the whole corm useless.

Use of 5% D.D.T. dust at the rate of one tea-spoonful per plant partly mixed in the soil around the base of the plant and partly spread on the plant has been found to be useful.

Grubs. The soil grub, about an inch in length, dirty white in colour, and with prominent brown head, is usually found in damp ground. It is a common pest of gladiolous corms. The affected plants give sickly appearance. As soon as an affected plant is detected, it should be lifted alongwith the corm. The grub may be removed in kerosinised water. The unspent corm is then replanted.

Borers. These pernicious insects bore inside the stalk and cause wilting of stems which is particularly noticeable on hot days. Once spotted, the borer should be killed by inserting a piece of wire inside the stalk without causing injury to the latter. Borers can also be killed by inserting a crystal of para-dichlorobenzene inside the stalk and then plugging the hole with mud plaster.

Thrips. These tiny insects are at times very active in sucking the plant juice from the lower underground portion of the plants and causing the foliage to turn yellow. The affected plants give sickly appearance. Spraying of 0.1% metasystox will check the spread of thrips.

DISEASE

Botrytis rot or Core rot. Affected corms become soft and show a dark brown colour with decay of flesh. Early infection may be confined to surface only but in a few cases the rot travels to the core as well. Leaf infection can be controlled by spraying 2% Diathane Z-78 twice a week, and the corms can be dipped in 1% mercuric chloride solution for an hour before actual planting.

Storage rot (Penicillium spp.) Large reddish brown lesion appears on the sides of the corm. On hills, affected corms often show white mycelium at the time of their harvest. Such corms should be treated with mercuric chloride before storage. At times lesions may appear on the corms which may be covered with bluish green masses of Penicillium spores. The disease develops rapidly if the corms are stored under wet conditions.

Dipping of affected bulbs in 1.0% solution of mercuric chloride before planting will check the spread of the disease.

STORAGE

As soon as the gladiolus leaves turn yellow during September-October on hills and April in plains, the corms should be dug out, cleaned and stored in sand or in polyethylene bags at a dry, cool and frost free place. For brief storage in plains, the corms can be kept in refrigerators.

NEW VARIETIES

The task of raising new varieties of gladiolus is by no means difficult because different varieties cro s easily with each other and produce seed in plenty. After selecting two parent varieties for certain characters, flowers are cross-pollinated after first emasculation and bagged. The capsules thus formed will provide a large number of seeds which should be sown with care in seed pens immediately after the harvesting of capsules in July-August. They will produce small cormlets and enter dormancy during winter. In March, these should be transplanted in beds and selections made for the desired types during August-September, when they will be in bloom for the first time. Having once selected a new type, its further multiplication should be done through corms and cormlets only.

At the Regional Fruit Research Station, a large number of new varieties have been evolved through hybridisation. These are at present undergoing rigorous selection.

At Mashobra, a large collection of gladiolus varieties has been made by introducing a number of promising varieties from within as well as outside the country. Brief descriptions of some selected varieties are given below, in order of their flowering time.

EARLY VARIETIES

Florence Nightingale. An American variety. Plants 1.25-1.45 metres tall, glistening pure white flowers with yellowish blotch, 10-12 cm. in diameter, 20-22

flowers per scape, bloom in third week of June; duration of bloom approximately 20 days.

Spic and Span. A Dutch variety. Plants 1.30-1.44 m. tall, 21-23 flowers per spike, rose coloured flowers with pale apricot blotch in the centre. Bloom in last week of June lasting for nearly twenty days. Flowers 10-11 cm. wide.

Blaur Domino. Plants 1-1.25 m. tall, most attractive blue violet coloured flowers with red blotch. Flowers of 10 cm. width, 12-14 per spike, bloom from end of June lasting 14-16 days.

King Lear. Plants 1.27 to 1.45 m. tall, deep purple flowers, 9-11 cm. broad, 12-13 per scape, bloom from middle of June for 16-18 days.

Hill Crest. Plants 1.35-1.40 m. flowers 12 cm. broad, deep rose coloured with cerise blotches on ruffled petals, 18-20 per scape, bloom from last week of June for 20 days.

Jenny Lind. A Dutch variety. Plants 1.43-1.47 m. all with attractive eye-feasting bright rose pink colour; 11 cm. broad, 16 flowers per spike, bloom from third week of June for three weeks.

Anne Virginia. Plants 1.0-1.25 m. tall, seventeen or more flowers per scape, 11-13 cm. broad, violet lavender with carmine blotch, bloom from middle of June for twenty days.

Gold Dust. A Dutch variety. Plants 1.25-1.45 m. tall. Butter-cup yellow, 8-10 cm. broad, 16-18 flowers per spike, bloom from the middle of June for 18-19 days.

Exotic double Sister Eliz. Kenny. A Dutch variety. Plants 1.10 to 1.20 m. tall, with one of the attractive forms of flowers having ridged petals. Flowers 10-13 wide, white double, 8-9 flowers per spike.

Mashobra No. 8. Plant 90 cm. tall, flowers of light pink colour with straight petals having a tendency to recurve. The throat is yellowish orange with carmine red scars on the lower half of petals. 13 flowers per spike, distantly arranged, 11.13 cm. wide. Flowering middle of June.

Rawi Fallu. Plant nearly 1 m. tall. Flowers purplish dark red, 15 flowers per spike, 7-8 cm. in diameter, flowering 1st week of June.

MID-SEASON VARIETIES

Oklahoma. An American variety. Plants 1.2 m. tall wih 13-15 cm. broad, lavender pink, smoky coloured flowers, 15-17 per scape with ruffled petals, bloom from 1st week of July for 20 days.

Hawaii. A Dutch variety. Plants 1.4 to 1.45 m. tall, 11-12 cm. wide, mahagony red, attractive, 16-17 flowers on each spike, bloom from 2nd week of July for 18-20 days.

La Paloma. Plants 1.2-1.5 m. tall, attractive, rich orange to light vermillion, 12 cm. wide, 18 flowers per spike, blooms from 1st week of July for 20 days.

Cardinal Spellman. A Dutch variety. Plants 1.2-1.5 m. tall, flowers 11-12 cm. broad, reddish-crimson with darker stripes on edges, 13-14 flowers per spike. Bloom from last week of July for 18-19 days.

LATE FLOWERING VARIETIES

Double Frills of Pink. A Dutch variety. Plants 1.1 to 1.2 m. tall, double flowers, pink colour with dark streaks on the margins of ruffled petals and white suffusion in the centre, 10-13 cm. broad, filled, bloom lasts more than a fortnight from 1st week of August.

Psitachinus Hybrids. Plants 1.7 to 1.8 m. tall, 9-10 cm. broad, flowers purple red or red with yellow blotch on very long spikes, on an average twentytwo flowers in each spike, bloom from third week of August and continues till November.

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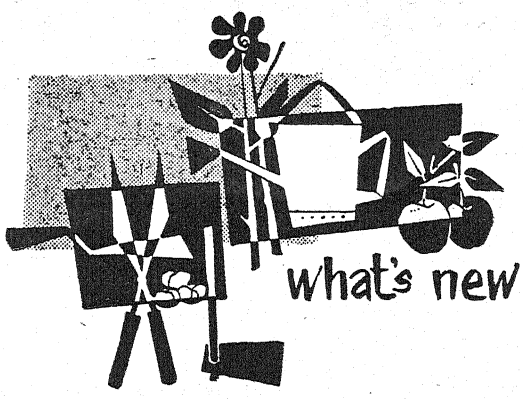

what's new in horticulture

Storage Life of Brinjals

Vegetables which are mostly non-acidic, and also fall an easy prey to micro-organisms, have a short storage life. A study on the effect of wax emulsion on the storage life of brinjals was made recently in the Directorate of Fruit Utilization, Lucknow. In a trial, one hundred freshly picked brinjals of uniform size and maturity were treated with 3% aqueous fungicidal wax emulsion by dipping them for a minute. The excess liquid was drained and the fruits dried under the draught of an electric fan. The fruits were then stored at room temperature (25°-45° C.) The fruits were examined for the extent of spoilage, physical and chemical changes, at a regular interval of four days. The results obtained proved that waxing of brinjals in 3 per cent concentration helped in reducing losses in weight and retarded chemical changes, i.e., acid, starch, sugars and ascorbic acid, materially. Storage life of brinjal at room temperature (25°-45° C) was extended by 30 to 40 per cent. Waxing also reduced microbiological spoilage.

Mushrooms Last Longer

The Netherlands Institute of Horticultural Research seems to have solved the problem of mushroom preservation. According to a report from the Institute, radiation of mush rooms with beta rays has proved a success. At a temperature of about 16°C, the caps of the radiated mushrooms remained closed much longer than those of the non-radiated samples; the taste, when cooked, the report says, was definitely better.

Fruit Drop in Mango

In a trial on the effect of irrigation on fruit drop and fruit development at Krishnagar, it became evident that in both the mango varieties, *Langra* and *Begum pasand*, the fruit drop was slightly more in irrigated (92.3 and 81.3 per cent respectively) than in un-irrigated treatment 88.2 and 63.8 per cent respectively). Regarding the development of fruits, the mean fruit weight of irrigated trees was slightly greater in early stages but the difference disappeared by the time fruits matured.

Gibberellic Acid Spray on Phalsa

Investigations on the effect of plant growth regulators on horticultural crops have been going on for several years in many countries. Recently , four trials were conducted at the Regional Fruit Research Station Cuddapah, on the effect of Gibberellic acid on phalsa with a view to increasing the fruit-set, size, and reduce the seed content of the fruits. In all the four experiments, the fruit-set, fruit retention, fruit weight, length and breadth of the fruit, seed content and brix were determined.

The sprays of gibberellic acid 500 ppm markedly impoved the fruit-set over all other treatments. The effectiveness of gibberellic acid on fruit-set, however, decreased with the increase in concentration. This experimental study has shown that gibberellic sprays are very promising in increasing the fruit-set and in producing seedless fruit on phalsa.

NEWS ROUNDUP

BANANAS ABROAD

The banana is now classed as a highly salable product and is being exported in large quantities to foreign countries. Italy has asked for 13,000 tons of bananas, Iraq 6,000 tons and Iran 5,000 tons. Exports to the Soviet Union alone were worth Rs. 17 lakhs and the despatches now to be made will bring in not less than one crore of rupees to the exchequer.

FRUIT CULTIVATION IN PUNJAB

There is a proposal before the Punjab Government to bring 40,000 more acres under fruit cultivation during the current plan period. The government has already brought 15,000 acres under fruit cultivation during the first three years of the plan. According to the proposal 10,000 acres would be brought under horticulture during the current financial year and another 15,000 acres during the next financial year.

Under the intensive fruit cultivation campaign, a chain of orchards and nurseries has been established in the State to release annually about seven to eight lakh fruit plants. At present, there are about 40 Government and over 100 private nurseries in the State.

MANGO TOFFEE

The Central Food Technological Research Institute has evolved a new recipe for mango toffee which is rich in calcium, phosphorus and β-carotene. The research centred on testing the effect of the addition of glucose on texture, and of processing temperature on the retention of ascorbic acid and carotene in mango toffee. The following recipe was adopted as standard.

Mango pulp (of about 18 deg. Brix)	100 parts
Cane sugar	45-48 ,,
Skim milk powder	13-15 ,,
Hydrogenated fat	7-8 ,,
Glucose powder	3-4 ,,

The mango pulp is first concentrated in an open steam-jacketed kettle to raise its Brix from 17-18 deg. to 32-33 deg., and then the other ingredients are added. Cooking is prolonged till the temperature of the mixture reaches about 125 deg C. when the product is ready for traying. It is then transferred to trays, rolled, cooled and cut into pieces of desired size. The pieces are allowed to stand overnight at room temperature (25-28 deg C.) before they are wrapped and filled into containers. The resulting toffee is described as good and very nutritive.

INTERNATIONAL BOTANICAL CONGRESS

India will be one of the participants at the tenth International Botanical Congress to be held in Edinburgh from August 3 to 12 this year. Over 1,000 botanists from countries all over the world will attend the congress. Papers at the conference will be read by botanists from India, Pakistan, France, Germany and other countries. Professor Harry Godwin, Professor of Botany at Cambridge University, will preside over the congress. A wide range of subjects of importance to agriculture, horticulture and forestry will be discussed.

The tenth congress coincides with the opening of a new £ 265,000 herbarium and library at the Royal Botanic Gardens, Edinburgh, and with the jubilee of the Scottish Seed Testing Station.

Delegates from India include Prof. T. S. Sadasivan of Madras University; Prof. K.N. Kaul, Director of the National Botanical Gardens, Lucknow; and Dr. A.B. Gupta of Christ Church College Kanpur.

Flowers Galore At Patna Show

Cut-flowers, floral arrangements, potted plants, fruits, vegetables and fruit products comprised the main exhibits at the Bihar Horticultural Show, held recently at Bankipur, Patna.

In the potted plants, the competitions were held among institutions as well as individuals. The potted plants included Carnation, Cineraria, Petunia, Pansy, Cactus and foliage plants like Crotons and Coleus, and as many as 244 exhibits were on display. One of the best exhibits displayed was a collection of six pots of different types of Coleus. The variegated leaves of all the six plants were very beautiful with different shades of colours.

Among cut-flowers excluding roses, as many as 279 exhibits were displayed. The most beautiful exhibit was Dahalia cut-flowers displayed by the Telephone Exchange, Patna, where six different varieties with different shades of colours were used. The roses as cut-flowers displayed by the institutions covered about 73 exhibits and that displayed by individuals were 68 exhibits. It was really a good sight to see all these cut-flowers of various varieties of roses in bloom. Most of the special awards and shields in this class went to Maharaja Kamal Singh of Dumraon, Patna.

In the class for vegetables, 294 exhibits were on display. The unique thing among the exhibits displayed was rare vegetables like leek, broccoli, Brussels sprout, celery, parsnip, etc. A special award in this class for the best exhibitor was given to Mrs. M.K. Jha.

Another interesting feature of the show was the competition held for *malies* for the display of best arranged bowl, bouquet, garland and the button-hole. There were 101 exhibits in this class. Each entry had

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Fruit That Grow Well In Delhi Region

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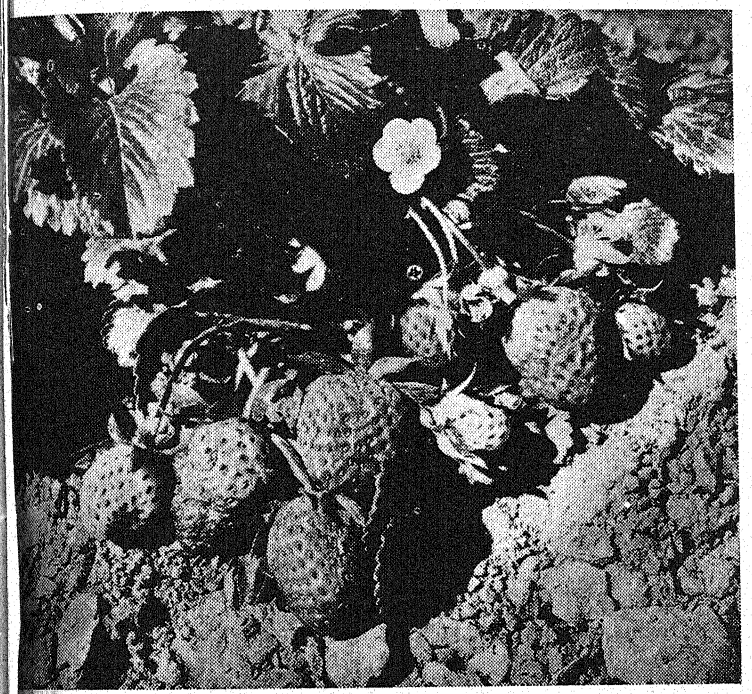
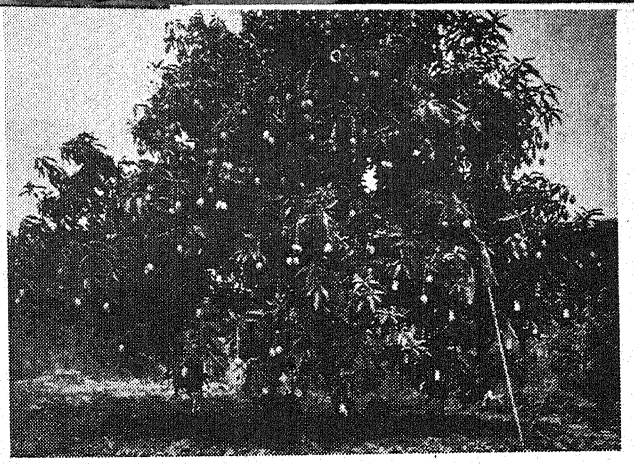
DELHI'S Soil and climatic conditions are suitable for the cultivation of many tropical and subtropical fruits, except in areas which have heavy or saline soil or high water-table. As the average rainfall is only 23" per year and not evenly distributed, most of the fruit plants have to be grown only under irrigated conditions. Broadly speaking, almost all the fruits can be grown here except the temperate ones. Even among



Strawberry fruits of the Pusa early dwarf variety

the temperate fruits, such varieties of peach, plum and pear as have very low chilling requirements, can be grown successfully under the conditions prevailing in Delhi. (Prospects of growing strawberry are also bright.) Among the tropical fruits, banana and papaya are adversely affected during winter, due to frost when the temperature goes below 40°F. However, fruiting time in banana may be adjusted in such a way that the bunches do not have developing fingers during December and January. Culinary varieties of banana are hardier and can withstand minor fluctuations in temperature during winter, and hence can be grown under Delhi conditions particularly in kitchen yards. A few varieties of litchi can also be commercially cultivated in summer, if adequate irrigation facility is available.



A young Dashehari tree in fruiting

Loquats do well under semi-shady situations; the fruits are likely to be sunburnt under fully exposed conditions.

Citrus varieties grow well in this region. Several varieties of sweet orange, grape, pummelo and lemons do very well, provided the soil is well drained and is not subjected to water logging. Adequate care should also be taken to correct micro-nutrient deficiency by spraying the deficient elements. *Kagzi* lime (acid lime), which is prone to canker disease, requires considerable care for raising it.

Almost all the North Indian varieties of mango can be successfully grown. Among the hardy fruits which can be recommended for large plantations, mention may be made of guava (*Psidium*), *ber* (*Zizyphus*), *aonla* (*Phyllanthus*) and *phalsa* (*Grewia*).

Grape does well both under tropical and subtropical climate. North Indian plains offer great potentialities for viticulture with suitable early varieties.

Although experimental records regarding the comparative performance of different varieties of fruit plants under Delhi conditions are available only for a few years, the following varieties may be successfully tried by the fruit growers of Delhi and adjoining areas.

MANGO

Mid-season varieties: (Ripening time-Latter part of June and early July)

Dashehari. Considering production and quality, this may be taken to be the best commercial variety for Delhi. Trees are semi-vigorous, erect in habit, less prone to biennial bearing and characterised by prolific fruiting. Planting distance 36' (11m.).

Fruits are broadly elliptical in shape, medium in size, sweet in taste with a delicious flavour; pulp is almost fibreless; keeping quality is very good.

Langra. It is another commercial variety of mango in Northern India, and is known by such names as Hardoi Langra, Hajipur Langra, Banarsi Langra etc. It develops good taste and flavour under Delhi conditions. Trees are vigorous, spreading, prone to biennial-bearing, but

A Pusa seedless vine in bearing

characterised by prolific fruiting in "on" years. In the initial stages, there is more fruit drop and hence not profitable in early years of fruiting. Planting distance is 40′ (12m).

Fruits are broadly oblong in shape and medium in size; pulp is soft, fibreless, with a very good blend of sweetness and acidity and, rich in vitamin C; keeping quality is medium; stone is thin and smooth.

Early Variety: (Ripening time-June)

Bombay Green or Yellow. This is also known by such names as *Sarauli* or *Malda.* Among the early mangoes, this is the most important commercial variety. But the variety is prone to biennial-bearing and much susceptible to malformation disease both of shoots and of flowers.

Fruits are broadly oblong in shape, medium in size; pulp is firm, fibreless, very sweet with an excellent flavour; keeping quality is poor.

Late Variety: (Ripening time-August)

Samar-Bahisht Chausa or Chousa. Among the late varieties, this happens to be the best North Indian variety. Trees are tall and vigorous but biennial-bearing; fruiting is medium; planting distance is 40′ (12 m).

Fruits are oblong, with a characteristic apical point; size is medium; pulp is soft, juicy, fibreless, very sweet in taste and delicious, and with a distinct aroma; keeping quality is medium; stone is thin and smooth.

Neelum. This is a commercial variety of South India but its habit is much changed when grown under Delhi conditions. Here it ripens as late as August; the trees are dwarfish and spreading; fruiting is medium; trees are regular bearers; planting distance is 36′ (9 m.)

Fruits are oblong with marked sinus; size is small, pulp is firm, less juicy, almost fibreless, quite sweet in taste with good aroma; keeping quality is medium.

It is a variety recommended particularly for back yards.

Planting and cultural hints

Grafts are planted in July. Plants, in their early stages, are to be protected from frost in winter and hot winds in summer. Frequent irrigation during summer is essential. Cultivation in young orchards does good to the trees. Nine kg. of the following fertilizer mixture should be applied to each tree in two doses, one in July and the other in Ferbruary, alongwith an application of 3 kg. of farm yard manure in October: Ammonium sulphate 6.81 kg. Superphosphate 20.43 kg. Potassium sulphate, 5.44 kg. Magnesium sulphate 4.99 kg.

Appropriate measures must be taken for the control of diseases and pests.

GRAPE

Although the performance of all the introduced varieties of grape has not yet been assessed, the following varieties have been found to perform well under the local conditions.

Bhokhri. It is a vigorous variety from Nasik (Maharashtra), and performs well under Delhi conditions. It ripens from the first week of June, and is a heavy cropper.

The variety bears medium to large bunches with compact shape. Berries are greenish yellow, spherical in shape and contain two to three seeds. The taste is slightly acidic but the yield per vine exceeds 9.08 kg.

Pusa Seedless. It is a seedless variety, similar to *Kishmish* of Afghanistan. It is a mid-season variety ripening during the second or third week of June.

The berries are small, oval, greenish yellow in colour. The taste and flavour are excellent. The variety is a medium cropper. Berries are quite sweet, and total soluble solids percentage exceeds 20.

Kandhari. It is another early maturing variety and the bunches start ripening by the second week of June under Delhi conditions. The bunches are large, with deep purple ellipsoidal attractive berries having normally two seeds. Ripening is not very uniform, taste is sweet and the flavour is very good. The total sugar content in the berries is 16-17 per cent. The average yield per vine is 3.30 kg.

Black Prince. It is a slightly late variety, and ripens by the end of June. It is a good cropper of moderate vigour.

The bunches are small to medium and well filled. The berries are deep purple and small sized. The fruit is sweet with a pleasant aroma. Total soluble solids percentage is 17-18. It can prove to be a popular variety in this area.

Gros Colman (Pusa). It is a mid-season variety ripening by the end of June. It is a heavy cropper of moderate vigour.

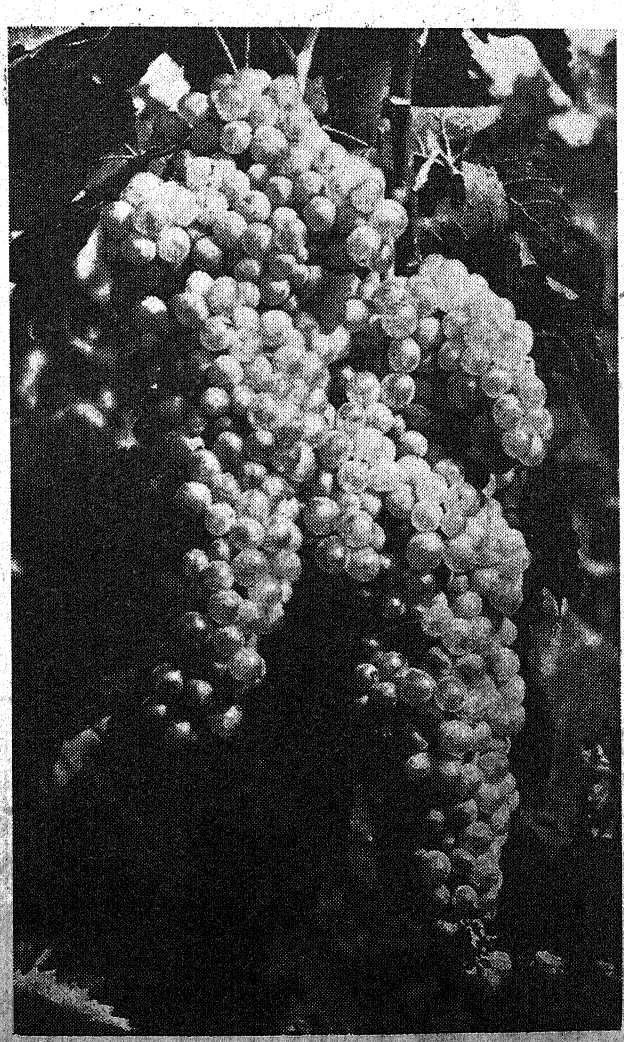
The bunches are big (about 400 gm. each) with round big berries which become yellowish green in colour after ripening. Ripening is uniform and the berries are sweet with a pleasant aroma. Total soluble solids percentage is 18.

It is one of the best grapes in quality that can be given a large scale trial in areas round about Delhi.

Planting and cultural hints.

One-year-old rooted cuttings are transplanted in pits 10′ (3m.) apart during December-January when the vines are in dormant condition. Vines are to be trained either on trellises or arbours, and should be pruned during January. Before the onset of spring, soil around the vines should be dug avoiding injury to roots, and NPK applied in the proportion of 4 :8 :4, the exact dose depending upon the type of training, age and condition of the vines. However, at least half of the total requirement should be applied in the organic form (well rotted farmyard manure) and the rest half may be applied in the form of artificial fertilizers. Vines should be irrigated regularly during summer months. Appropriate measures are to be taken for the control of diseases and pests which are not a serious problem in this part of the country.

Two ripe bunches of Pusa seedless grape



CITRUS

Almost all the varieties that have been introduced here, perform well under the local conditions. However, the following varieties have given excellent performance both from production and quality point of view.

Marsh Prolific. Trees of medium vigour; bearing very good; fruit medium to big in size, quite juicy; skin of medium thickness; taste excellent and flavour very pleasing; total soluble solids percentage 8-9.5.

Foster Pink (seeded). Trees vigorous; bearing prolific, fruits medium sized, very juicy; skin thin to medium; taste excellent and flavour highly pleasing: flesh pink; total soluble solids percentage 9-9.5.

Foster Pink (seedless). Trees of medium vigour; bearing good; fruit of medium size, very juicy; skin thin to medium, flesh of light pink colour, and devoid of seeds; taste excellent and flavour very pleasing; total soluble solids percentage 9-11.

Lemon. This variety can be recommended for home gardens.

Malta. It flowers almost throughout the year, with two main seasons, i.e., February to April and August to October. Fruits in bunches; obovate in shape and yellowish in colour; seeded, with medium juice content and high acidity.

Seedless. It is characterised by few thorns and is a continuous flowering type with two distinct flowering seasons, i.e., January to April and September to October. Fruits oblong, pulp slightly greenish yellow, pleasantly acidic and distinctly aromatic.

Italian round or Kagzi Kalan. Plant drooping, flowering in February and March; fruit round, medium-sized, thin rind, greenish yellow on ripening, and is very juicy; heavy yielder, average 3-4 hundred fruits per tree.

Nepali Oblong. Plant of spreading type, flowering throughout the year with two distinct seasons as in Malta and Seedless. Fruits large-sized with pronounced nipple, very juicy and seedless; heavy yielder and suitable for kitchen garden.

SWEET ORANGE (MALTA)

Hamlin. Trees semi-vigorous; bearing good; fruits globose, size medium, thin rind, juicy but apt to granulate after maturity; few seeded; early ripener (by the end of November); taste very good and flavour pleasing; total soluble solids percentage 9-10.

Pineapple. Trees semi-vigourous, bearing good; fruits globose of bright shining orange colour, thin rind, size medium, quite juicy, juiciness retained even late in the season; taste excellent, highly pleasing flavour; a mid-season variety; total soluble solids percentage is 9-11.5

Mosambi. Trees of medium vigour; bearing very good; fruits sub-globose with shallow longitudinal furrows on thin rind, fruit size medium; pulp apricot-yellow in colour and very juicy; taste good and with pleasing flavour a mid-season variety; total soluble solids percentage is 9-12, in some cases, as high as 13.

MANDARIN (SANTARA)

Kanpur. Trees vigorous with upright growth; bearing good; fruits sub-globose, orange in colour; size medium, quite and distinctly flavoured with good taste; total soluble solids percentage 7-8.

Planting and cultural hints. Among the citrus fruits, cultivation of sweet orange and santara requires constant care. These are planted in July, and cultivation along with some leguminous cover crops improves the condition of plants. As the feeding roots are confined mostly to upper four feet depth of the soil, water-logging should be avoided to check the water-table coming up to this depth. Special care should be taken to supply adequate amount of irrigation to the trees during summer. As in the case of sweet orange trees, symptoms of zinc deficiency are common throughout the country; spray of zinc sulphate should be included in the regular cultural schedule. Symptoms of decline due to virus should be immediately noted and affected trees removed. Three lb. of nitrogen should be applied to each bearing tree. Half of this should be in the organic form (farmyard manure) and half in the inorganic form (ammonium sulphate). Time of application for the organic and inorganic manures is January and March respectively. All the diseased and dead woods should be removed periodically from the trees. Regular insecticidal spray should form a part of the cultural operations.

Adequate care should be taken to plant only such budded material which has been propagated from virus-free mother tree whose performance records are known.

LOQUAT

Loquat trees have recently been affected by some fungus disease in this area, which has resulted in considerable casualty to the trees. However, on the basis of the performance of varieties recorded earlier, the following two varieties are found promising.

Improved Golden Yellow. An early variety; fruits medium in size, golden yellow in colour; taste superior and sweet; seeds two-to-three; total soluble solids percentage 11.1.

Improved Pale Yellow. A mid-season variety; a selection from the Pale Yellow; fruits slightly roundish in shape, medium in size; colour of the skin paleyellow; taste quite sweet and delicious; total soluble solids percentage 11.8.

Planting and cultural hints: Inarched or budded plants are planted in the field during July. Plants should be well established in the nursery before they are transplanted in the field. Since the varieties are self-incompatible, only one variety should not be planted in an isolated block. Water-logging must be avoided under all situations. Every bearing tree should be supplied with 0.74 quintal of farmyard manure by the middle of April. During July-August this should be supplemented with 1.80 kg. of super phosphate, 2.70 kg. of potassium sulphate and 0.90 kg. of ammonium sulphate per tree.

PAPAYA

In areas round about Delhi, papaya is adversely affected by frost. Under extreme frosty conditions, papaya plants are killed outright. Therefore, papaya can be grown successfully in this area, only under protected conditions. Varieties of papaya are yet to be standardised; however, the following type introduced from Indore has been found to do well under the local conditions.

Barwani. Plants vigorous and bearing heavy; fruits big in size, elongated, with smooth and shining surface; flesh colour, orange or yellow; taste sweet, flavour pleasant.

In Memoriam

Late Shri U. Narasinga Rao

It is hard to reconcile that Shri U. Narasinga Rao, Deputy Agricultural Commissioner, Indian Council of Agricultural Research, is no more. After a brief illness in New Delhi, he passed away on May 16th, 1964 at the age of 51.

Shri Narasinga Rao hailed from a respectable Gowda Saraswat family from South Kanara district (Mysore State). Born in 1913, he had his early education at Mangalore and graduated from the Agricultural College, Coimbatore in 1935. He had a brilliant record in his studies.

He joined the Indian Council of Agricultural Research as Assistant Agricultural Commissioner in the year 1958 and looked after various schemes in the field of horticulture, plantation crops, entomology, mycology and medicinal plants. He visited London and Ghana in 1960 in connection with cocoa development work and was responsible for initiating development schemes in cocoa in the country. In July, 1961, he was promoted to the post of Deputy Agricultural Commissioner (Horticulture). In 1963, he visited U.K. besides various European and South-East Asian countries as a member of the Banana Delegation for surveying the foreign markets for export of banana. He was a member of various scientific committees and boards, and was co-convener of the Working Group on Horticulture for the Fourth Plan. His knowledge of the subject was comprehensive and his views were greatly respected by his colleagues and superiors. Shri Rao had a natural flare for writing in English language with ease and confidence. Author of over fifty publications, his interest was varied; he had worked on different plantation crops, viz., spices, cashewnut, cocoa, fruits, vegetables, ornamental plants, etc., during his brilliant career.

He was one of the founders and the first editor of the quarterly journal known as 'South Indian Horticulture' and was also Vice-President of the Horticultural Society of India. His innate energy and passion for sincere and hard work marked him out as one of the best and conscientious workers of the country. The country has lost a distinguished horticulturist, a devoted worker in the field of agriculture, and, above all, a kind and sincere person.

Planting and cultural hints: Papaya seedlings are planted in July under perfect drainage conditions. Any water-logging in the field is likely to kill plants. Close plantings and some protective hedge on the borders will obviate the hazard caused by frost. Other usual precautions to ward off the adverse effect of frost must be taken. Male plants should be weeded out allowing only about 10 per cent of them to remain. Usual hoeing, weeding and irrigation operations should be carried out at regular intervals.

The following two varieties can be successfully grown.

GUAVA

Lucknow-49: Trees dwarfish and spreading; fruits medium to big-sized, with surface either smooth or sometimes slightly undulating; pulp fine in texture, with less seediness, and excellent in taste and flavour.

Safeda Allahabad: Popular commercial variety of North India. Fruits big-sized, oblate in shape, uniformly light yellow on ripening, texture of the pulp is fine, seediness is medium, sweet in taste and with excellent flavour.

Planting and cultural hints: Seedlings of guava are not true to type and hence inarched or budded plants should be planted in the fieldr during July. Trees should be trained in the beginning by pruning so as to give them a definite form. Rainy season fruiting should be discouraged so as to get a full crop during winter. This can be accomplished to some extent by withholding irrigation during summer.

This is a hardy fruit and does not require much care. It can be grown even under conditions not suitable for other fruits.

PEACH

It is essentially a temperate fruit but has a wide range of varieties having different chilling requiremen s. One variety 'sharbati' has been found to be well suited for being grown in the pla ns.

Sharbati: An early variety; a prolific bearer; fruits medium to large in size with reddish flush on the skin, very juicy, sweet and delicious with an excellent flavour. It is a clingstone type.

PLUM

Alucha Red: An early variety with prolific fruiting; fruits roundish, skin colour is pinkish red on ripening, flesh clings to the stone, sweet with good flavour.

Alucha yellow: It is almost like Alucha Red, except that it develops yellow colour on ripening.

In case of the above two varieties, Alucha Black should be planted as a pollinating crop.

Howe: This variety bears crimson-coloured fruits with juicy flesh, flesh texture melting with aromatic flavour and sweet taste. It comes into fruiting during June under Delhi conditions.

Planting and cultural hints: Plums and peaches are planted in the field during January when they

are in dormant stage. Peaches start fruiting earlier than the plums. Pruning in the earlier stage should be done with a view to giving a proper form to the trees. Peach is susceptible to waterlogging and hence adequate care should be taken to keep the field well drained. Trees ought to be copiously irrigated when fruits are developing. Regular pruning of bearing peach trees keeps them in healthy condition. For controlling peach leaf curl in the plains, spray of diesel oil emulsion or tobacco leaf decoction should be done twice in the season.

Litchi: Although litchi has been introduced at the orchard here recently, the following variety has been found to thrive well in Meerut and other western districts of U.P., wherever there is ample provision for irrigation during summer.

Calcuttia: This is a late variety with prolific bearing habit. Fruits slightly oblongish in shape, light red in colour, large to medium in size; skin thick, pulp white, slightly coarse in texture, juicy, quite sweet in taste with good flavour.

Planting and cultural hints: Well established air-layered plants are planted in the field during July. It is rather difficult to establish litchi plants due to its extreme susceptibility to frost and, therefore, adequate care should be taken to protect it from frost during winter. It is advantageous to take berseem as a cover crop during summer in a bearing orchard. Litchi trees should be frequently irrigated during summer in order to keep the humidity high, in the orchard. Suitable windbreaks should be provided on the western side to mini mise the adverse effect of hot winds during summer.

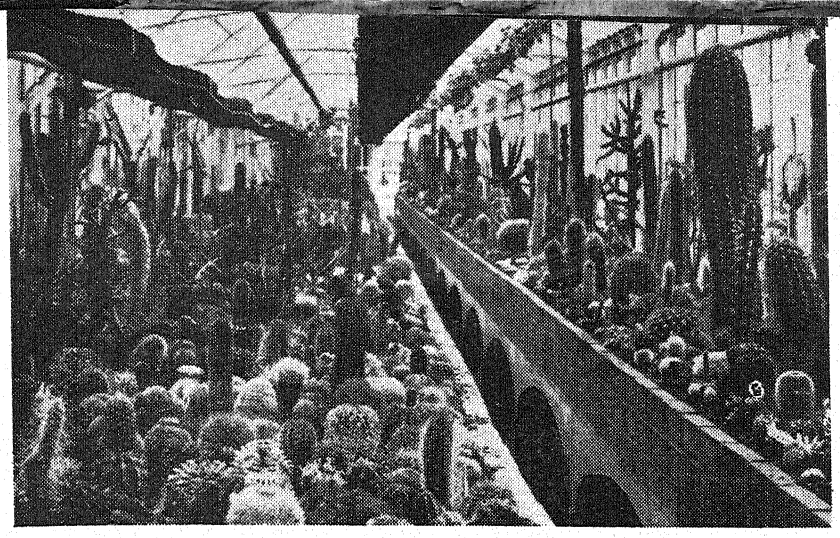
STRAWBERRY

Pusa Early Dwarf: An early variety; medium cropper; bears large attractive fruits with good taste and flavour. Fruits available from March to April under Delhi conditions.

Planting and cultural hints: Strawberry runners are planted during September-October on ridges. Proper preparation of field is very essential before the actual planting is done. This involves application of adequate amount of rotted farmyard manure so that subsequently only topdressing with fertilizers may be enough to meet the growth and fruiting requirement of plants. Water stagnation in the strawberry plot should be avoided under all circumstances. Regular hoeing, weeding and irrigation is essential for the healthy growth of the runners. Care should be taken not to wet the fruits while irrigating the plants. Fruits should also be protected from birds.

Besides the above fruits, other less important fruits like *phalsa*, *ber*, jackfruit, etc. can also be grown successfully around Delhi. These fruits have no selected varieties yet.

A limited number of plants of majorty of the varieties of frutits listed above can be made available from the Division of Horticulture, I.C.A.R., New Delhi—12. It is, however, suggested that orders may be placed one year ahead so that adequate arrangements can be made for budding or grafting the particular variety, which is not always in stock.



A view of Edleman's private collection

FROM DESERT WEED TO ORNAMENTAL PLANT

Another View of the firm's private collection

THE LITTLE VILLAGE REEUWIJK in the Netherlands has rightly earned a place on the map of Horticulture industry. The biggest cactus nursery in the world managed by Mr. Edelman, hums with activity in this small village. A beginning with this nursery was made more than 40 years ago, but it took several years before it assumed any importance worth the mention.

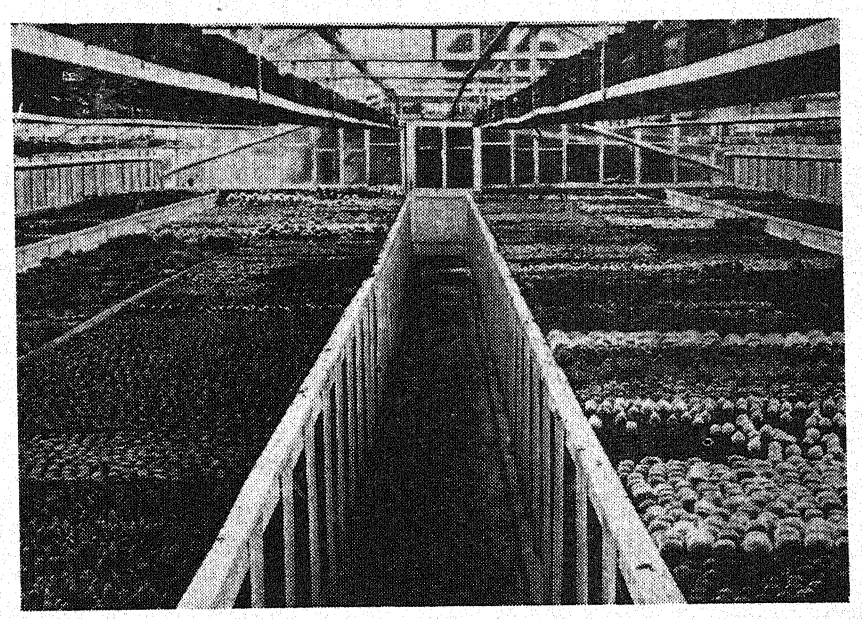
Mr. Edelman had a fancy for cacti from his childhood and he used to collect and grow cacti even at the age of 12 when he started his career as a tree nursery man; after working for 25 years in this line, the attraction of the cacti became too strong for Mr. Edelman, and his hobby became his profession. In one small greenhouse he started with success to grow them for the trade. Very soon a second greenhouse had to be built followed by a third and a fourth after a short interval. Now, there are seventeen greenhouses functioning.

The present total covered area of the greenhouses available is 3,500 sq. meters. Besides this there are several frames erected in the open, in which a large number of plants can be accommodated during the summer season.

The collection of seeds and plants of this 'desert weed' known as 'cactus' arrives at Reeuwijk periodically from New Mexico.

The plants on arrival from Mexico are planted in the greenhouse and after they have recovered from travel and replanting shock, cuttings from these plants are taken and planted. Some precious and often slowly growing varieties are grafted on a faster growing cactus variety in order to obtain quickly useful material for trade. Through this cutting and grafting, one attains annually a culture of more than a million plants. In this way it is possible to raise annually a total of more than three million cacti. The green-houses are heated by a fully automatic oilburning heating-plant, due to which it is possible to give each green-house the required temperature which it needs at various times. All the soil to be used is first steamed in order to eliminate all the harmful things for the growth of the cacti, which might be present there.

It is a delight to both professional man and an amateur to see the green-houses with their huge masses of cacti in an unlimited number of varieties.



View in seedling greenhouse; picture shows seedlings of one and more years old

TIME TO PLANT BOUGAINVILLEAS AND CANNAS

(July-September)

The rainy season is the best time for planting trees, shrubs and climbers. Why not plant a few Bougainvilleas this year in your home garden? Recently several new varieties of Bougainvillea have been introduced in our country. The Lalbagh Botanical Gardens, Bangalore, maintains a nice collection of all the important varieties of Boungainvillea. A few promising new varieties are the Lady Mary Baring, which has turmeric yellow-coloured flowers—a new colour hitherto unknown in Bougainvillea, the multi-bracted or double-flowered Roseville's Delight having apricot orange bracts and B. Mahara with rhodamine purple double flowers. The double, flowered varieties were introduced from the Philippines by the Lalbagh Botanical Gardens. A nursery in Poona recently released a variety having tricoloured flowers. Although the variegated Bougainvilleas have already started becoming popular it would be appropriate to mention about them here. Some of the outstanding variegated varieties are B. Rao, B. Thimma, B. Laksminarayan, B. Vellayani and B. Sharma, all of which originated in the Lalbagh Botanical Gardens.

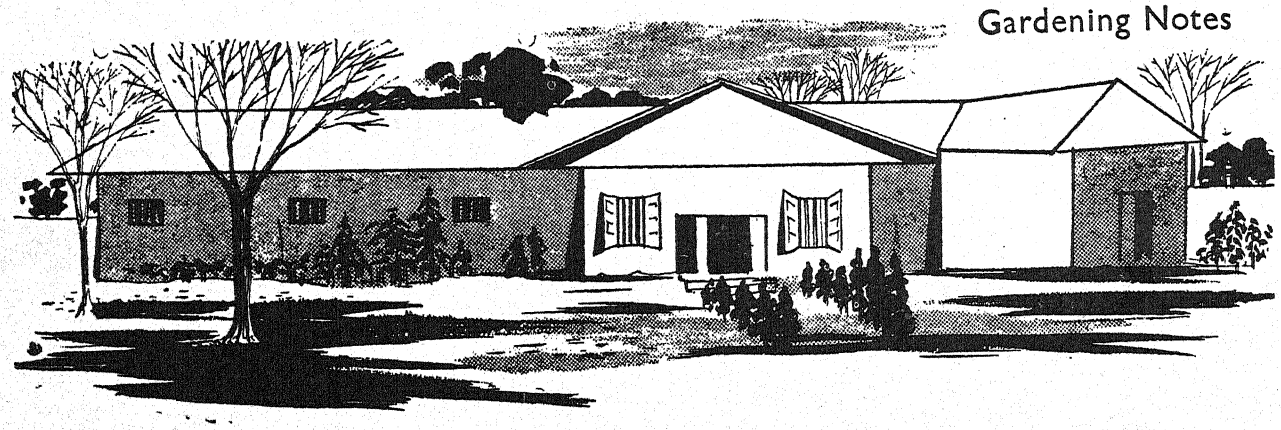
Another sowing of Gaillardia, Balsam, Gomphrena, Cosmos, Cockscomb and Zinnia can be done in early July for late flowering. Some of the hardy winter annuals like Aster, Phlox, Petunia, Dianthus, Coreopsis, Godetia, Salvia and Nasturtium can be sown in July-August. Those annuals which take longer time to bloom, such as, carnations and Cineraria may be sown in August-September. Bulbs of Narcissus, Daffodil, Dahlia and Gladiolus can be planted in September.

The rainy season is the proper time to propagate by cuttings and repot foliage plants like Dracena, Diffenbachia, Crotons, Scindapsus (Pothos), Ferns, Coleus and others. The cuttings of Dahlia, Carnation and Geranium can also be planted during this time.

In July, Cannas may be planted in well manured beds, and rootstocks of roses can also be planted for budding in December-January.

In August, the final potting of Chrysanthemums should be completed. They may be planted in 10-inch pots with a rich mixture of three parts soil, one part leaf mould, one part cow-dung manure and half-a-part sand with half of an ounce each of superphosphate and sulphate of potash added to each pot. Later, the plants need staking. In beds, the plants should be planted not later than the middle of September.

If you are interested in raising Dahlias from cuttings, plant the tubers in early July. In August, the terminal plump cuttings taken from the shoots which arise from the tubers, may be planted in small pots along the edge. The pompons and miniature bedding types of Dahlias are not so well known in our country as the Giant-flowered varieties. The pompons are popular in other countries and are ideal for growing in pots and beds. They bloom profusely and have both cactus and formal decorative types of flowers in numerous colours. The bedding Dahlias are best for mass effects because of their profusion of flowering and dwarf height.



KITCHEN GARDEN

In the kitchen garden, seeds of *bhindi*, tomato, cowpea and *guar* can be sown in July. Seeds of bottlegourd, *tinda*, bittergourd, pumpkin, brinjal, chillies, early cauliflower, *chaulai* and *kulfa* can be sown in early July if not already done in June. The early *desi* potatoes, Gola and Up-to-date can be sown in September. Cabbage, mid-season and late cauliflower, knol khol, radish, turnip, beet, carrot, spinach and lettuce may be sown during the second fortnight of September. The mid-season cauliflowers can also be sown in August. The new variety of carrot, Pusa Kesar, and turnip, Pusa Kanchan, both being hybrids between Asiatic and European varieties of carrot and turnip respectively may be tried.

VISHNU SWARUP

YOUR GARDENING PROBLEMS

Q: I have a fairly big patch of tomatoes in my kitchen garden. This season, the fruits are not developing while the foliage is massive. Please suggest remedial measures.

B.S.R. Sekhar
Bangalore

Ans: Perhaps your plants are growing in too loose or too rich a soil, and the fruits are not swelling as the energy is being used up in vegetative growth. Do not feed any more. Give a dressing of a quarter ounce of sulphate of potash to each plant, sprinkling this in a circle around it and watering in.

Q: The mango trees in my garden have suffered extensive damage due to termites. Please suggest some effective method to get rid of this pest.

S. Singh
Amritsar

Ans: Injury from termites to mango trees upto three years old is common. They seldom attack the healthy and vigorous trees. Clean cultivation, frequent irrigations, interculture and hoeings and avoiding use of partially decomposed manure or farmyard manure are the usual methods adopted to rid the trees of termites.

A strong solution of sanitary fluid (3 parts of the fluid in 100 parts of water) should be poured into the irrigation ring in order to protect the roots from termites. The tree trunks may also be painted with sanitary fluid at the rate of six ounces of fluid per tree up to seven inches above the soil.

Q: I have a desire to cultivate carrot in my vegetable garden. The soil is well drained, deep and loamy. What are the sowing time and seed-rate ?

J. Panthulu
Hyderabad

Ans: Carrot thrives best in a well drained, deep, loose, loamy soil.

In the plains, carrot is sown from the middle of August to the end of November. The *desi* carrot seed may be sown up to the middle of October only. The seed of European types of carrot should be sown from the middle of September to the end of November.

Good, clean seed should be sown at the rate of three to four seers per acre but the unclean, chaffy seed that is available in the villages is sown six to eight seers per acre. An ounce contains about 24,000 seeds. The percentage of germination of the country carrot seed is rather low, ranging from 65 to 80.

FLOWER SHOW CONTD.

FROM PAGE 16

different arrangements with different varieties of flowers. The best display in this particular class was a bouquet where the exhibitor had used a simple arrangement of Sweet Sultan flowers around a single rose.

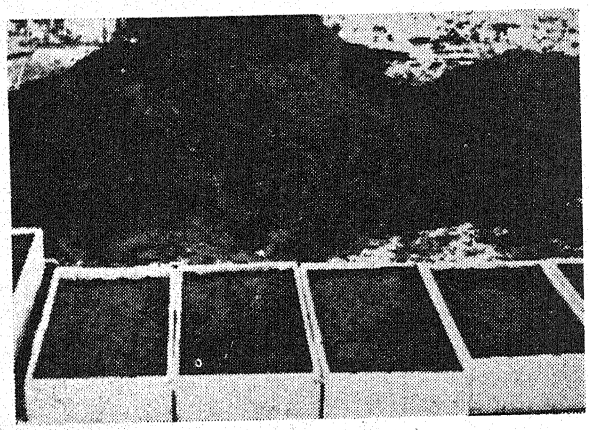
A mention may be made about the garden competition which included large, medium and small gardens, kitchen gardens, parks and gardens attached to institutions. The best entry among the gardens was Maharani of Hathua's garden. This garden is probably the best private garden in the city of Patna. The garden has been beautifully laid out with well carpeted lawns, flower beds, flower pots and big herbacious border. The statues and the fountains in the garden are an added attraction. Shri H. Krishnamurthy's garden won the second place in the competition. The garden has well maintained lawns with flower beds and a herbacious border. The star-shaped flower beds around a small tank and a well laid out rosery look very attractive.

You Too Can Grow Common European MUSHROOMS

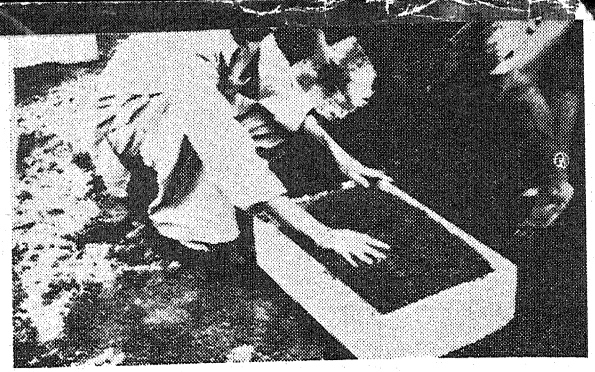
H.S. SOHI AND P.K. SETH
Dept. of Agriculture, Himachal Pradesh, Solan

THE EDIBLE MUSHROOMS, so far considered a delicacy and an extravagance for a privileged few, may soon be within the easy reach of the common man with its rising production in the country.

Mushrooms are very temperamental, and require specific conditions for their growth. Droughts or uncongenial temperatures, even for a very short time often injures or inhibits the growth of crop. For successful mushroom growing, careful attention must be given to three points—good manure, pure spawn and a constant temperature. Indifference to or neglect of any one of these essentials may result in complete failure of the crop.



Trays full of composi ready for pasteurisation



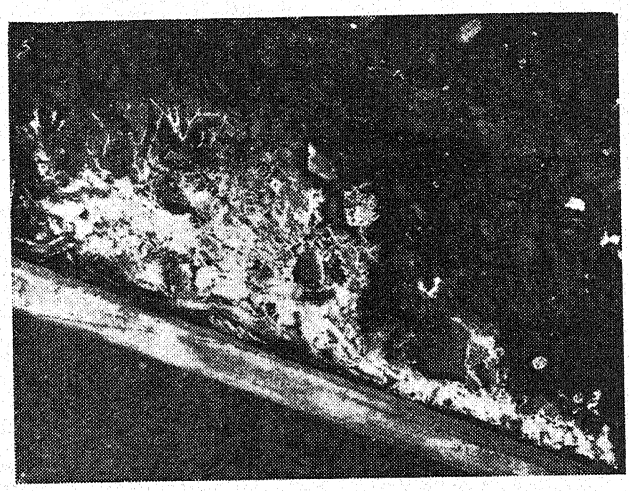
Filling compost in trays

THE NATURALLY-OCCURRING MUSHROOMS

Though, in India, mushrooms have been known as an article of diet from very ancient times, systematic work on its cultivation had not been initiated till recently. At present, the edible mushrooms are collected from their natural habitat with the result that the produce is limited, and the product is costly. Because of the natural occurrence of some of the edible mushrooms in the forest areas of Himachal Pradesh, a scheme for growing the common European mushroom *Psalliota bispora* artificially in Himachal Pradesh was sanctioned during 1961, by the Indian Council of Agricultural Research, New Delhi. This variety has been successfully grown under laboratory conditions at the Plant Pathology Laboratory, Solan (5,000 ft. m.s.l.). Trials to grow the same indoors at higher altitudes have also been successful at Gopalpur (6,900 ft. m.s.l.). Outdoor trials are in progress at various places in Himachal Pradesh.

EFFORT FOR CULTIVATION

The details of the various methods used for growing the common European mushroom in the present studies are described here.

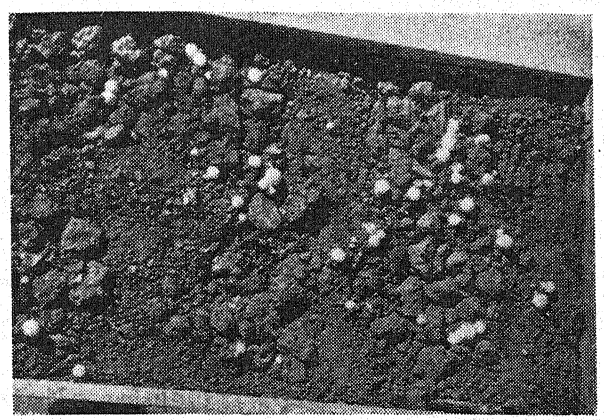


Spawned compost showing spread of mycelium of the mushroom prior to casting

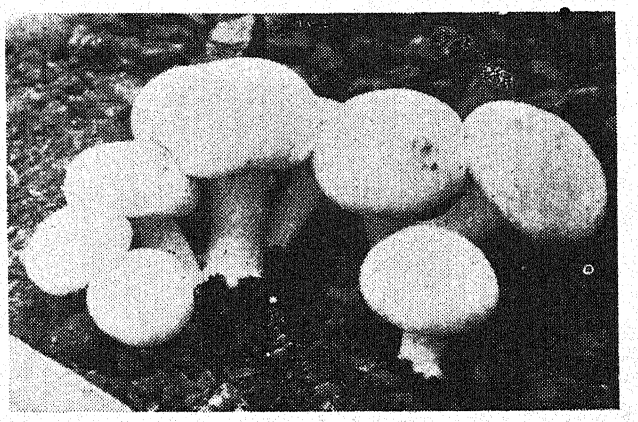
Selection of manure. Horse manure has been found to be very satisfactory for the commercial cultivation of mushrooms in foreign countries but as it is difficult to secure an adequate quantity of this manure in India, other manures were also tried to find out a suitable substitute. Out of these, cow-dung has comparatively given better yields of mushrooms. The dung was collected in fresh condition and stored under cover. The composting was done in a room with a concrete floor, disinfected previously with formalin.

Preparation of compost. About 21 md. of cow-dung, seven md. of wheat-straw (6 inch pieces) and 28 lb. of gypsum were taken and mixed thoroughly.

The mixture was then piled in heaps of 4-6 ft. height. The heaps should never be less than 3 feet high, for smaller heaps do not ferment properly. Lesser quantity was found undesirable for ideal composting. Adequate quantity of water was added to the manure at the time of putting it in the heap. After making the heap, the manure was pressed firmly, as the presence of too much air in the heap might result in burning. Then the manure was allowed to ferment for about a week and the temperature rose to about 130-140°F. The manure was given three turns at almost weekly intervals to ensure a uniform compost. During each turning the manure was shaken well, and water was added when necessary as correct amount of moisture in the compost was essential for proper fermentation. The compost was ready for use in the beds in about 3-4 weeks time. It was dark-brown in colour and damp, not very wet with a uniform temperature and without any objectionable odour.



Appearance of mushrooms after casting



Mushrooms suitable for picking

Preparation of beds and Pasteurisation. The composted manure was then transferred to trays of 2′×15″×6″ size and pressed down firmly. These trays were subsequently placed in racks in a closed room. The temperature was then raised to about 140°F. by heating for pasteurisation and that was maintained for about 48 hours. Afterwards the temperature was allowed to come down to 75°F. for spawning the trays of beds.

Spawning. For spawning, holes were made in the beds in a diagonal manner about one foot apart with the help of a thumb or a stick and small pieces of the manure spawn were then inserted in these holes. The spawn was planted at a depth of about ½ inch. After seeding, the compost was pressed firmly against the spawn to obtain good contact. The beds were covered with moist sackings and the temperature was maintained at 75°F. to initiate the growth of the fungus. Light sprays of water were given at frequent intervals to maintain the humidity of the beds between 70 and 80%. After about three weeks, the fungal growth was observed on the surface of the compost in the form of whitish mould-like growths.

Casing. After the fungus had sufficiently grown, the trays were cased with a thin layer of sterilized clayey loam soil (about one inch depth) having a neutral pH for inducing the production of fruit bodies. The temperature of the beds was maintained at 55-56°F. The beds were sprayed with water lightly 2-3 times daily. The mushrooms started appearing after about 15-21 days and continued for about 2-4 months.

NUTRITIVE VALUE OF MUSHROOMS

Cultivated mushrooms find a place in human diet not only for their good flavour, but also because of the great food value which they possess. Mushrooms also play an important role as condiments of food accessories and as a flavouring agent, and add greatly to the palatability of many other foods. Their food value is increased by the addition of milk or butter, often used in their preparation for the table. Mushrooms contain much less protein than meat and fish but compare favourably with most of the fresh vegetables in protein content as their protein value is two times that of asparagus, cabbage and potatoes and six times that of oranges. The mushrooms have a higher mineral salt content than even beef and almost twice that of any vegetable.

MEDICINAL VALUE

These contain iron, copper, patassium and calcium. Being also entirely devoid of starch, the mushrooms are an exceedingly useful food for diabetic patients. It is also useful for those who wish to get rid of their extra weight. These are an excellent source of riboflavin and nicotinic acid and a good source of pantothenic acid. They also contain appreciable amounts of thiamin and biotin. These vitamins are well retained during cooking, canning and dehydration or freezing of mushrooms.

Mushrooms may even be a cure for cancer, for it is interesting to note that mushroom growers in France have never been known to suffer from this malady.

Horticultural Abstracts

Abstracted by
P. S. BOSE

I. TROPICAL FRUITS

CHADHA, K.L. AND KIRPAL SINGH, K.

Studies on the fruit drop in Mango.

Indian Jour. Hort **20** (3 & 4): 172-185; September-December. 1964.

Blooming in Mango started early in March and peak flowering occured about mid-March in all cases. An average sized panicle produced 1300-1400 flowers during one year. The percentage of hermaphrodite flowers progressively increased from the base to the apex of the panicle. Only 7-12% of the mature pollens were found to be imperfect or shrivelled, while about 80 per cent of the pistil were deformed or defective. The proportion of the later even overshadowed the importance of sex ratio in fruit set. The receptivity of stigma was nearly halved by the postponement of pollination to the second day after anthesis and further halved if pollination was done on the third day. In the absence of abnormal weather conditions on the factors namely, sex ratio condition of pistil and the extent of natural pollination mainly determined the percentage of initial fruit set. Fruit set under normal conditions seemed to be sufficiently high as not to require any supplementary means of pollination. Ultimate fruit retention in all the varieties was low when compared to the initial fruit set. Eastern and western aspects of the tree appeared to be more congenial for final fruit retention than the northern and sourthern aspect due to the varying conditions of light intensity and its duration received by the tree during the course of its day. Panicles located deep in the crown carried less number of fruits to maturity as compared to those situated on the periphery of the tree.

PAUL S.C.

Cultivation of arecanut palm in the sub-Himalayan of Bengal and some suggestions for improvement in the existing method.

Arecanut. J. **14**: 64-7; 1963

Seedling production and establishment in the field, harvesting and pest and disease control briefly outlined.

PURSEGLOVE, J.W.

Some tropical tree crops and their centres of origin.

Span **6**: 126-9; 1963

Includes cocoa, coffee, tea, hevea, coconuts and oil palms.

II. SUB-TROPICAL FRUITS

BHAMBOT, J.R. AND UPPAL, D.K.

Studies on the fruit set and fruit fall in Sweet Orange (*C. sinensis*) **in the Punjab.**

Him. Hort. **4** (2-3) : 23-24; April-September, 1963.

Studies were conducted on Blood red and Mosambi varieties to assess the extent of blossom retention on different aspects of the tree. Eastern and western aspects appeared to be more suitable for retention of final fruit. Maximum fruit set occured on the upper portion of the crown in the initial stages and the least in the lower one. Maximum fruit retention was in the middle portion of the crown. Fruit set and retention was more on the periphery of the tree.

MARLOTH, R.H., BASSON, W. J., AND BREDELL, G.S.

Spot-light on valencias.

Fmg. S. Afr., **39** (6): 40-3; 1963.

Data are presented on the vigour, yield, fruit size and quality observed in trial of 13 of the best known valencia selections and selections of other late maturing varieties of sweet orange and rough lemon rootstocks in the eastern Transvaal Lowveld. The Johnstone Valencia selection is recommended as a heavy bearer of quality fruits with few seeds.

467 HODGSON, R.W., SINGH, R. AND SINGH, D.

Some little known Indian Citrus species *Calif. Citrogr.* **48** : 357-64; 1963

Descriptions of C. semperflorenens, C. regulosa, C. Combara, C. latipes and citrus indica are given.

III. TEMPERATE FRUITS

468 BEYERS, E.

Control of mineral Nutrition of deciduous fruit trees and vines

S. Afr. J. Sci., **53**: 311-15; 1963.

Rate of application of fertilizer is adjusted according to the production potential of a tree by using the minimum quantity of a balanced NPK. fertilizer mixture correlated with its performance. For efficient use, the type of fertilizer is also integrated with the pH level of the soil. Diagnostic leaf analysis is applied currently in order to ensure an optimum content and balance of all essential nutrients. Standard index values have been established to assess the nutrient status in terms of leaf composition. In addition, symptom expression is employed as necessary corollary to integrate plant performance with these two techniques. Application of a combination of these methods makes it possible to assess the optimum and the most economic fertilizer treatment for maximum growth, yield and quality under the conditions prevailing in any orchard or vine yard.

469 CHADHA, T.R. AND THAPAR, A.R.

Studies on the propagation of Persimon.

Hort. **4** (2 & 3); 9-23; April-September, 1963.

Attempts made at the vegetative propagation of persimon by ordinary methods as employed with apple, peach etc., have met with little or no success. Work carried out at Horticultural Research Station, Kulu, has shown that *Dioepyros lotus* is most suitable rootstock. Stratification of seeds is not necessary. Sowing from December-March at 1"-2" depth gives good germination. Early sowing at 1" depth and late 2" depth. Crown or collar grafting proved most successful.

470 SKEPPER, A.H.

Pruning leaders of young pear trees.

Agric. Gaz. N.S.W. **74**: 199-201; 1963.

Wide-angled frame-work branches on pear trees can be obtained by double pruning the leaders on the young trees. In winter the leader should be pruned back to 2 or 3 buds above the bud selected to produce the leader extension; in spring, when the new growth is 2 inches long, the old leader should be cut back against to the wide angled shoot arising from the previously selected bud.

IV. MISCELLANEOUS

471 WAY, J.M., AND DAVIS, B.N.K.

Hedges as a Feature of our countryside.

Agriculture **70** (12) : 565-568; December, 1963

A detailed description of hedges and wild life, effect of hedge composition, effect of hedge treatment, and hedge pests is given.

472 MARKS, G.E., AND K.A. BECKETT.

The cytology of Forsythia Beatrix Farrand and its relaed cultivars.

Euphytica Netherlands Jour. Plant Breeding 12 (1): 32-34; illus. 1963.

Forsythia Beatrix Farrand is shown to be a tetraploid (2n=4x=56) and not a triploid as previously reported. It is self fertile and gives tetraploid progeny with a wide range of phenotypic variability. It is therefore of great potential value as the starting point for breeding other tetraploid Forsythia cultivars.

473 ASEN, SAM AND MORRIS LIEBERMAN

Keeping roses light with ethylene oxide, a possible break through in increasing the longevity of cut flowers is indicated by USDA experiments.

Exchange (Florists) **139** (4): 32-33; illus. 1963.

Roses of 3 varieties held at 60° F in a closed chamber with 0.25% ethylene oxide for 20 hours delayed opening for 70 hours at 70°F without injury, while untreated roses opened in 40 hours. Treated roses had better colour and retained petals longer. Ethylene oxide above 0.3% was injurious. High concentrations of the gas are toxic to man.

474 SIMANCIK, FRANTISEK, AND ANTON LAFFERS

Vplyv Kyseliny giberelovej na Klicnie semen tuje vychodnej (Thuja orientalis). [The influence of gibberelic acid on the germination of seeds of Thuja orientalis.]

Biologia **18** (1) : 72-75; illus. 1963 (Russian and German summ.)

The described experiments show that by immersing seeds of T. orientalis in solutions of 75 and 100 mg/liter of gibberellic acid, germinative energy increased noticeably in the case of 100 mg/liter solution the individual count increased by 15%.

475 OSBORNE, DAPHANE, J.

The Hormonal Control of Plant Growth.

World Crop: **181**-187; May 1963.

In this article, the influence of the physiological condition of the plant on the variable balance of these is very aptly discussed and reference is made to the potential practical implications of this subject.

V. PESTS AND DISEASES

476 BARABINO, G.

The identity and relationships of sap-transmissible viruses isolated from Italian grape-vine.

Hort. Res. **3** (1): 27-33; Nov. 1963.

Sap-transmissible viruses were isolated from plants of grape-vine showing characteristic symptoms of infectious degeneration, but not from plants free from these symptoms. Isolates of different origin were all distantly related to arabis mosaic virus but were serologically indistinguishable from one another and from Portuguese isolates of grape-vine fanleaf and yellow mosaic viruses. The results help to establish that there are few or no antigenic differences between isolates of grape-vine strain of arabis mosaic virus from different European countries.

477 ALVAREZ GARCIA, LUIS A.

Glomerella Gummosis of citrus species in Puerto Rico.

Jour. of Agriculture of the University of Puerto Rico.

57 (1) : **38**-40; Jan. 1963.

This article deals with the results of research on a serious gummosis disease found in the Isabele region, especially attacking citron, grape fruit, sour orange and orange.

Further studies indicated a rapid spread of the disease in the vicinities of Isabela. Adjuntas and Jayuya, seen now "in scions and grafting stocks in nurseries and groves" of citrus. Inoculations of the fungus on these citrus fruits proved the pathogenicity of this organism. Then accurate control methods were adopted by inoculating spore suspensions into the injured tissues and keeping these seedlings at a temperature range of 24° to 26° C and a relative humidity of 60 to 80 per cent.

Control seedling with stem injuries, but no fungus spores inoculated into them were also held under these scientific conditions until they healed well, thus developing healthy callus around the inactivated diseased areas.

However, the "Glomerella gummosis", as it is called, is not necessarily a foot rot. It attacks through stem wounds and even causes leaf infections that then invade the petioles and enter stems where it causes pitchy lesions, and "teardrops" ooze from cankers.

VI. VEGETABLES AND OTHER CROPS

478 GRIFFING, B. AND J. LANGRIDGE

Factors affecting crossing over in the tomato.

Aust. Jour. Biol. Sci., **16** (4): 826-837; Nov. 1963.

An experimental technique utilizing two seedling mutants permitted an extensive survey, involving over 129,000 observations, of environmental and genetic factors affecting crossover frequency in the tomato. A significant decrease in crossing over associated with aging was demonstrated for a plant pruned to bear fruit clusters only on the main stem. Again appeared to be the main cause of significant differences in crossing over detected between data collected for different branches on an unpruned plant.

Although many experiments were made, including treatments with inorganic and organic chemicals, and grafts with other species and genera, no environmental factor gave significantly increased crossing over between the test loci. Pronounced decreases in crossing over were caused by increased sodium ion concentration, certain organic chemicals, and grafting on potatoes.

The genetic background was shown to have a highly significant effect in altering cross over frequency.

479 JONES, L.H.

The effect of soil moisture gradients on the growth and development of Broad Beans (Vicia faba L.)

Hort. Res. **3** (1) : 13-26; Nov. 1963.

Limited available soil volume in higher water-table treatments restricted root growth and may have resulted in exhaustion of nutrients; nevertheless, good plants were produced with the water-table only 6 inch below the soil surface. Maximum root development in all treatments occurred where the soil water content was at or above the field capacity.

Papaya (Carica papaya)—Fruit is rich in carotene and Vitamin C →

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Contents

OUR COVER

Chittidar guava. This variety from Uttar Pradesh is famous for its eating quality. *Chittidar* is a round, smooth-skinned, white-fleshed sweet guava with red spots on its skin.

Photo: **Gurcharan Singh**

Editor: **P.L. Jaiswal**
Assistant Editor: **M.V. Narayana Rao**

←Torch tree, *Ixora arborea* (Syn. *I. parviflora*)

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Editor's Page

CANNING OF FRUITS AND VEGETABLES

THERE used to be a saying that 'the Americans eat what they can and can what they cannot'. We have yet a long way to go, in spite of the potential resources and man-power we have, to reach anywhere near this self-sufficiency in production and preservation of fruits and vegetables.

The efficiency of our body and mind depends upon a properly balanced diet. Regular use of fruits and vegetables means better health, and canning can make them available all round the year. It is an economical way of preserving fruits and vegetables when they are plentiful.

The canning industry has made rapid progress since Nicholas Appert first experimented with a glass and a hand-made cork about a century and a half ago. To-day, canning is recognised all over the world to be the most practical method of storing large quantities of fruits and vegetables for use in lean months. In India too, fruit canning industry is fast developing, and if our fruit growers have not got rich dividends from their sales to canners, it must be attributed to lack of transport facilities and efficient organisation.

The expected annual production of processed fruit and vegetable products during the Third Plan is about 70,000 tonnes. This target has to be raised to 150,000 tonnes by the end of the Fourth Plan. The industry cannot achieve this goal so long as it remains beset with problems at levels of planning as well as implementation. The problems are many but they are not insurmountable. It becomes, therefore, imperative that every detail, at all stages of planning, whether at the farm or at the factory, gets careful attention. It is important that the site for the factory should be well chosen, so that supply of fruits and markets may be assured. Fine quality fruits, essentially at can-ripe stage, must be grown at the spot or grown not very far off so that there should be the least delay between picking and processing of the fruits. Quick transportation and communication facilities, which are at present far from satisfactory in our country, are of vital importance to canning industry. 'An hour from the field to the Can', should be the accepted ideal.

Equally important are the modern machinery for canning such as the automatic or semi-automatic machines for extracting citrus juice, coring and slicing pine-apples, high speed filling, sealing and labelling which are not being manufactured at present in our country. Therefore, there is no alternative to import of such machines for some time to come. The Government, no doubt, will give all possible assistance for mechanization of this industry. The Central Food Technological Research Institute, Mysore, is striving hard to find solutions for the problems which stand in the way of development of this industry. Given the assistance it deserves, fruit and xegetable canning industry can contribute substantially to the export earnings of the country. With the increasing realisation of the value of fruits and vegetables coupled with the industrial expansion of our country, there is every likelihood of fruit canning industry getting a great fillip.

Dentzia staminea, *an attractive shrub that bears fragrant flowers*

Wild Flowers of Kulu Valley

Flowers of the main valley and Chanderkhanni Pass

J.N. SHARMA and VISHNU SWARUP

The beauty of the Kulu Valley lies in its woods, where myriads of most exquisite flowers of every conceivable colour and hue revel in nature. Many of these fade out unseen and unadmired; with its matchless treasure of wild flowers, the Kulu Valley is a veritable paradise for flower lovers, plant hunters and botanists. It offers them an opportunity to study nature at its best and provides a rich harvest of plant species for the natural scientist. Both hiking and plant hunting are a pleasure particularly during the spring and summer.

During the last four years the authors had the opportunity of exploring the main valley as well as some alpine meadows and forests with a view to studying and collecting the interesting local flora. The main aim was to collect only those wild flowers which had the promise of domestication and use in the garden as attractive ornamental plants. A systematic study on collection, domestication, evaluation and utilization of the varied wild flora has since been started at the Vegetable Breeding Sub-station of the Indian Agricultural Research Institute at Katrain. The present article describes the promising wild flowers that abound in the main valley and the Chanderkhanni Pass (12,000 ft. and above).

The main valley, surrounded by high peaks including the mighty Dhaula Dhar mountain range, runs from Aut (3,000 ft.) to the famous Manali (6,500 ft.), a distance of about 42 miles. The Chanderkhanni Pass (12,000 ft.) is situated in the north-east while on the north lies the Rohtang Pass (14,000 ft.) which leads to the mystic Lahoul and Spiti Valleys.

In the vale of Kulu at the height of 4,000 ft., anything from rice, apples, almonds, apricots, cherry, walnuts, pears, plums, vegetables to daffodils and narcissi can be grown to perfection. Similarly, the wild flowers that grow in abundance in this valley are no less varied. One begins to wonder what makes these plants grow so luxuriantly. Unlike other parts of the Himalayas where the monsoons deluge early during the summer months making the plants look like a carpet of velvety green, the rainy season in the Kulu Valley is bright and showery which enables the plants to flower profusely during this period. By November, a protective layer of snow covers all mountain ranges except the lowest hills and the main valley which shelters the plants from the harsh climate that comes down from the Lahoul, Spiti and the Tibetan plateau lying to the North.

Main valley

In the month of January, the higher mountain slopes have nothing but snow. Between the end of December and early February, the main valley gets occasional snowfall which melts away quickly and does not last more than a fortnight. During the winter almost all

trees except evergreens are without leaves. Even these bleak cold months have something to offer. At the end of January, the wild *Prinsepia* (*P. utilis*) comes into bloom displaying its attractive flowering branches studded with small (¼ in.) pearl-like creamy-white flowers. From January till March the single *Narcissus* (*N. lazetta*) which has become an escape in the valley can be seen flowering in masses or clumps along the banks of the rivulets, *nallah* and waste lands. It gives out long trusses of white fragrant flowers having cream yellow corona till the end of winter.

THE STATELY TULIPS

Early March brings the lovely spring to the main valley and from this month onwards till autumn, the valley is a vast ocean of wild flowers, either herbs, shrubs or trees. The queen of the wild flowers, the tulip of the Himalayas (*T. stellata*: Liliaceae), locally known as *madaula* comes into flower from early March (lower valley) till the end of April (upper valley). Its long (1½ to 2 in.) exquisite white flowers having red colour on the outer perianth with yellow in the centre, open like a star in the bright sun-light and close in the shade. The unopened flower buds are also enchanting. It is a memorable sight to see these stately star tulips blooming profusely in fields along the road during early summer. Almost simultaneously the buttercups (*Ranunculus laetus*—perhaps a variety of *R. acris* and *R. arvensis*) adorn the fields, pastures and marshy lands, known by the local people as *bihals*. The wild apricots (*Prunus armeniaca* and some other species), peaches (*Prunus persica*) and pears (*Pyrus pashia* and other species) all belonging to the rose family (Rosaceae) provide, when in bloom, a mass of colour, though these are short-lived. Their sprays of white, light pink and scarlet flowers covering the entire tree in the early spring are a sight for the Gods.

Two most important and attractive shrubs come into bloom by middle of April. These are the *Deutzia* (*D. staminea*) and the *Hypericum* (*H. patulum oblogifolium*). The *Deutzia* flowers in April and some of the plants have been seen flowering even at the end of May. There is much natural variation in respect of the size of plants, shape and size of flowers and time and duration of flowering. In some of the plants, there will be nothing but flowers at the time of blooming. Its white pearl-like buds and small (½ in.) open fragrant flowers are most fascinating and refreshing, particularly in the evenings.

The *Hypericum* (*H. patulum oblongifolium*) is a small shrub that can be found anywhere from the dry rocks to the rich humus-filled areas in the forests. Its bright yellow flowers with a central mass of protruding anthers set against the glossy leaves are outstanding in beauty. A few other species which are sub-shrubs and herb also inhabit the valley.

THE HIGHLY FRAGRANT ELAEAGNUS

Another ornamental wild deciduous shrub that flowers in April-May is the *Elaeagnus* (*E. umbellata*). It is a thorny shrub having numerous small sweet smelling white tubular flowers studied all over the branches which attract bumble beeds and other insects; from its highly fragrant flowers it is easy to spot it from a distance. Walking around is a pleasure in the evenings during these months when this shrub is in full bloom.

Besides these shrubs during April-May, some small growing plants like the mat-forming bright purple-flowered wild thyme (*Thymus serpyllum*: Labiatae), the bell-shaped deep blue gentians (*Gentiana argentea*) and the Dandelions (*Taraxacum-spp.*) with yellow flowers cover the ground all along the paths and sub-paths within the valley. A very attractive wild relative of the onion (*Allium rubellum*) which is more common in the flower valley, also flowers during April-May. Its small bright purple umbels along with the light blue flowered *Salvia* (*S. lanata*) when growing together in the same field are most captivating.

In the upper valley, the wild deciduous climber *Clematis* (*C. montana*) adorns the forests with its shining white flowers (2 to 2½ in.) that hang down from the trees and shrubs. This wild species of Clematis has already been brought under cultivation in Europe and other countries and is prized for its early flowering.

MILES-LONG STRETCHES OF MUSK ROSE

In May the musk rose (*Rose moschata*) starts flowering in the lower valley and continues till June in the upper valley. Growing miles and miles along the mountain slopes, the musk rose makes a wonderful setting and a beautiful spectacle to behold. Its numerous white five-petalled flowers fill the air with its sweet musky odour. Its growth is vigorous and is often found climbing on tall trees which get laden with its white flowers when it is in full bloom. The less common but attractive shrubs to flower during May, June and July are the *Spiraea* (*S. canescens*) and *Sorbaria* (*S. sorbifolia*). The latter (*Sorbaria sorbifolia*) which is like *Spiraea* produces terminal pyramidal panicles of white flowers and in the former dwarf *Spiraea* species (*Spiraea canescens*), the minute white flowers are borne in corymbs at the end of short leafy twigs all over the branches in the form of sprays.

Many other shrubs which flower during June to September are the various species of *Indigofera*, Jasminums including the yellow flowered species (*Jasminum*, humile), the tall shrub *Ligustrum* (*L. compactum*) with creamy white flowers and *Lonicera* the relative of the Honey-suckle. With the coming of October, the valley starts turning into gold and red. Except for the evergreens, the foliage of all herbs, shrubs and trees in preparation for winter changes its colour into various hues of yellow, red and scarlet.

Chanderkhanni Pass

By June the snow starts melting from the higher reaches. As we ascend higher from Naggar on the north-east, passing through the dense forests of pine, deodar and other stately evergreens and a few deciduous trees with ferns growing in the rich humus as the undergrowth, we come to the lower reaches of the well known pastures leading to the Chanderkhanni Pass. On the lower meadows (6000 to 8000 ft.) the fine velvety turf is studded with numerous colours of the wild *Anemone* species (*A. vitifolia*), *A. obtusiloba*, A. rivalaris and others: the yellow-flowered *Ranunculus* (*R. diffusus*) and the white flowering *Potentilla* species (*Potentilla fruticosa*). Here and there in the marshy places, a very close relative of the Marsh marigolds (*Caltha laeta*) with deep yellow flowers appears in the pastures. These vast pastures full of attractively coloured flowers are a continuous sight which finally seem to get merged with the horizon. It indeed requires much courage for the flower-lovers to make their way trampling through these beautiful meadows of flowers. While Anemones, Ranunculi and Potentillas make large beds of different colours and hues, the bold Marsh marigolds display their most exquisite tall bright golden flowers.

Walking through these pastures, one finally comes across a little higher slope where in early June the blue lilac *Primula* (*Primula denticulata*) can be seen growing in clumps sending out its long and short majestic globose heads. Along with these grows the wild rose (*Rosa spinosissima*) that bears single rose-coloured flowers on a straight bush which is about four to six feet tall. An interesting variant of *R. spinosimsima* with white single flowers instead of the usual pink has been seen in flowering on the other side of the Chanderkhanni Pass on way to Malahna, a village towards the Parbati valley. In June, huge chuncks of glaciers, partly melted and partly intact are found above 9000 ft. No sooner these glaciers melt than a dense aggregation of Pink Primulas (*Primula rosea*) with short-stalked Calthas suddenly appears, as if out of nowhere. Acre after acre of Pink Primulas mixed with yellow Calthas against a backdrop of glacier and Rhododendrons present a delightful sight, especially after an arduous climb of about 11,000 ft.

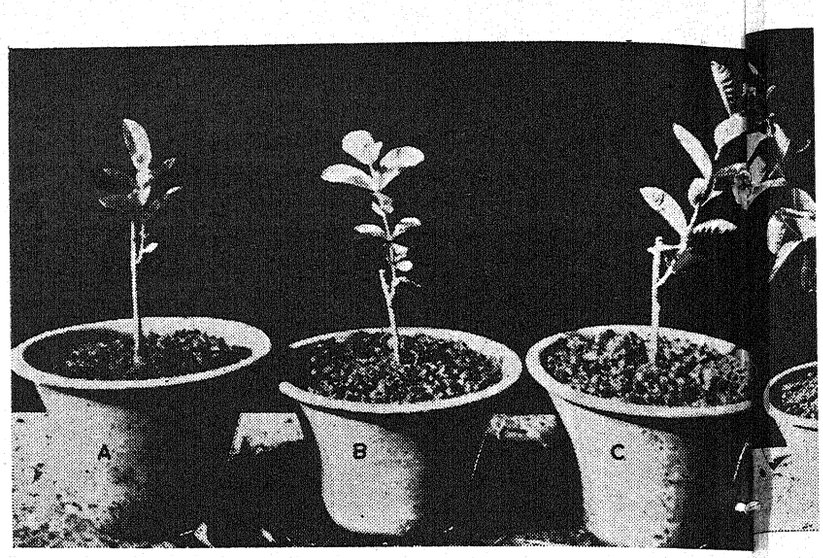
RHODODENDRONS—A TREAT TO PLANT LOVERS

The Rhododendrons of the Chanderkhanni are a special treat to the plant hunters. The most common species (*Rhododendron campanulatum*) with rosy-purple flowers starts from 9000 ft. and their well arranged borders, as if planted in a garden, run all along the path. Towards the summit, the terrain becomes more stony where only a few hardy plants like the Rockfoil (*Bergenia ligulata*) with exquisite panicles of small pale red flowers and green glabrous leaves and some grasses are found to grow. The bright blue spots within the petals with its shiny dark green silvery leaves make the Rhododendron an unrivalled beauty. It continues to flower from June till early August. Within the clearings, where there are less Rhododendrons, can be seen clumps of the white sweet-smelling (in corymbs) *Valeriana* species (Fam: Valerianaceae), the dwarf pale lilac-spotted Iris (*I. nepalensis*: Iridaceae) and the pleasing golden yellow flowered *Corydalis chaerophylla* (Papaveraceae).

As we ascend higher, the tall (6 to 12 ft.) Rhododendrons (*R. campanulatum*) become scare and another interesting dwarf (2 ft.) species of Rhododendron (*R. hypenanthum*) appears on the scene. This shrub is highly aromatic having beautiful sulphur yellow flowers that have characteristic odour of their own. At the top, above the tree-line, the dwarf Rhododendrons, Irises, Primulas, Bergenias and Valeriana grow and flower from June till August after which they set seeds and eagerly await the first snow which soon covers them with a protective covering till next June, saving them from the treacherous cold weather. In June again the same drama starts; the snow melts; the plants come out from seeds, flowers come in profusion and set seeds, and by August again, everything gets covered under snow. Year after year and season after season, this drama, which the nature has ordained, is enacted by these bewitching flowers on the peaks that surround this lovely valley, the Valley of Gods.

INARCHING is widely practised by the nurserymen for vegetative propagation of guava but it is costlier as well as a time consuming method. Why not replace this by budding?

An attempt was made to explore the possibilities of guava propagation by budding. The results showed that improved Forkert and patch methods in the months of July and February could profitably be followed as a commercial method of vegetative propagation of guava. The method would be of great economic importance in the eastern part of Uttar Pradesh known for guava cultivation.



Budded plants of guava
A. Shield ; B. Patch ; C. Forkert

Propagating GUAVA *by budding method . . . .*

R.P. SRIVASTAVA
Horticulturist, Govt. Fruit Research Station,
Chaubattia (Almora) (U.P.)

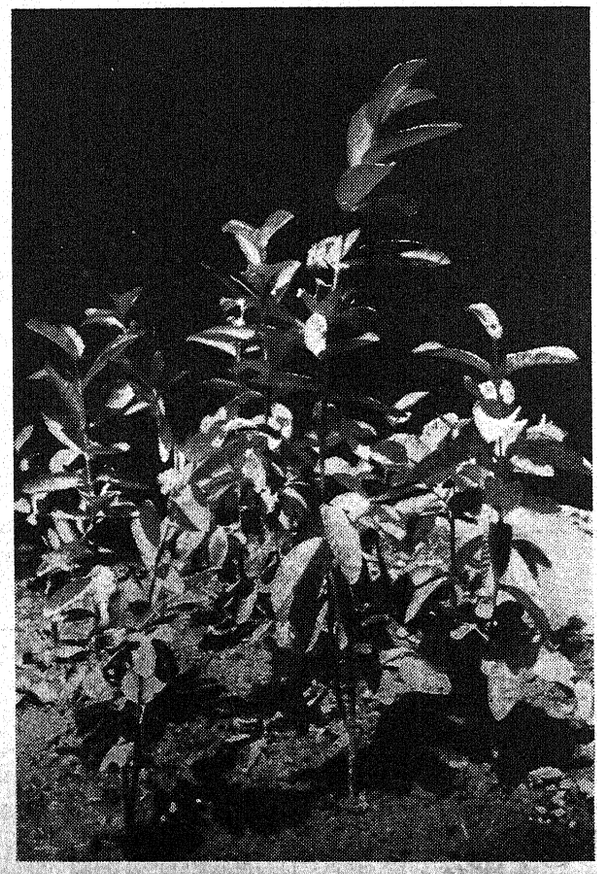
The trial was a success in July and February when a maximum of 96 per cent buds under improved Forkert and patch methods sprouted vigorously. In every month of budding, Forkert method proved to be the best. The percentage of establishment after transplanting was more than 90 per cent in majority of cases.

METHOD OF PROPAGATION

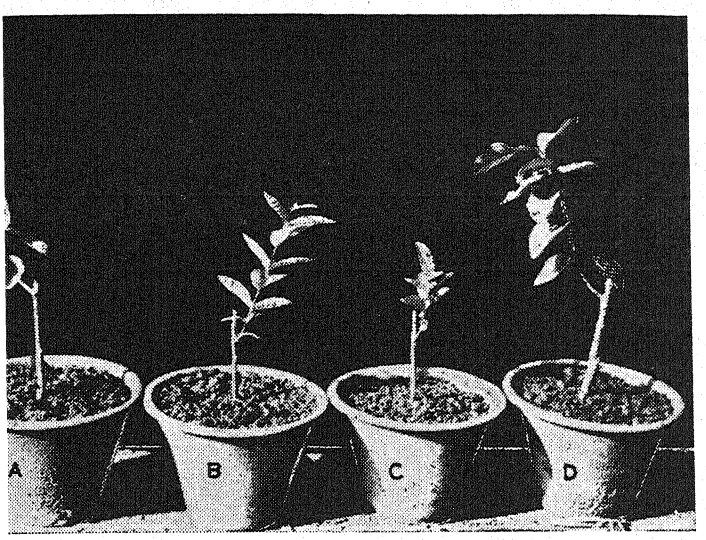
Root stock: Seedlings of about one year in age, uniform and active in growth are selected. The thickness should not be more than that of an ordinary lead pencil.

Selection of the bud: It is advisable to take well-swollen and unsprouted dormant buds from leaf axils of mature one-year-old twigs. The buds used in this trial were selected from the twigs detached from the trees of Safeda and Seedless varieties of good performance.

Budding: The prepared buds used in the Forkert and patch methods are of 2 x 1 cm. and budded at a height of 15-20 cmd above the ground level. In both the methods, buds and operated portions are covered with alkathene tape after budding, which is a modification over simple Forkert and patch methods. For



A group of budded plants of guava (eight months old) in flowering and fruiting



Budded plants of guava prepared during February and July,
A. Forkert (Feb.) ; B. Forkert (July)
C. Shield (July) ; D. Shield (Feb.)

better results the operation should be completed within two to three minutes. The buds are opened two weeks after the operation.

Clipping of root stock: When the alkathene tape is removed, the buds are examined for the 'bud-take'. The proper indication of bud-take (union) is confirmed, which is very prominent in guava, specially in February budding. One-third of the top of the stock is clipped immediately for initiating the growth of the buds. The remaining portion is cut two to three weeks after the first cutting leaving 2-3 cm above the bud.

Various aspects of study reveal the fact that the bud-take is 100 per cent in case of Forkert and patch methods. Shield budding was also tried with buds 2.0 cm. in length but the results were not encouraging. There is a remarkable difference in the growth of the plants budded by different methods. The plants propagated by Forkert budding prove to be superior followed by patch ones. Shield budding is not a success as growth performance and establishment are unsatisfactory. The details of the results obtained during the year 1961-62 are given in the table on Page 8.

The results show that improved Forkert and patch methods yield as good results in February as in July. Experience gained during the last three years shows that the mortality of the plants prepared in February can be controlled if they are transplanted in shade and are protected from extreme suffer heat. The July budding is the best as the maximum can be achieved at this time without any special care. It is interesting to note that the budded plants after transplanting grow very vigorously all the year round and start flowering within six to eight months of budding (Fig. 3). However, it is always safer and better to remove the flowers for at least two years so that the vigour and growth of the plants may be encouraged.

Percentage success of transported guava buds (Var. Seedless) at different intervals

Set No.	Days after detachment	Date of budding (July)	Bud-take (%)	Bud sprouted (%)	Survival after transplanting (%)
I	*Waxed bud sticks*				
	2	11th	100	92	100.0
	7	16th	100	80	100.0
	14	23rd	100	50	100.0
	21	30th	—	—	
II	*Unwaxed bud sticks*				
	2	11th	100	92	97.8
	7	16th	100	72	98.6
	14	23rd	100	—	—
	21	30th	—	—	—
III	*Control (Fresh buds)*				
	—	11th	100	96	100.0
	—	16th	100	92	100.0
	—	23rd	100	92	100.0
	—	30th	100	84	100.0

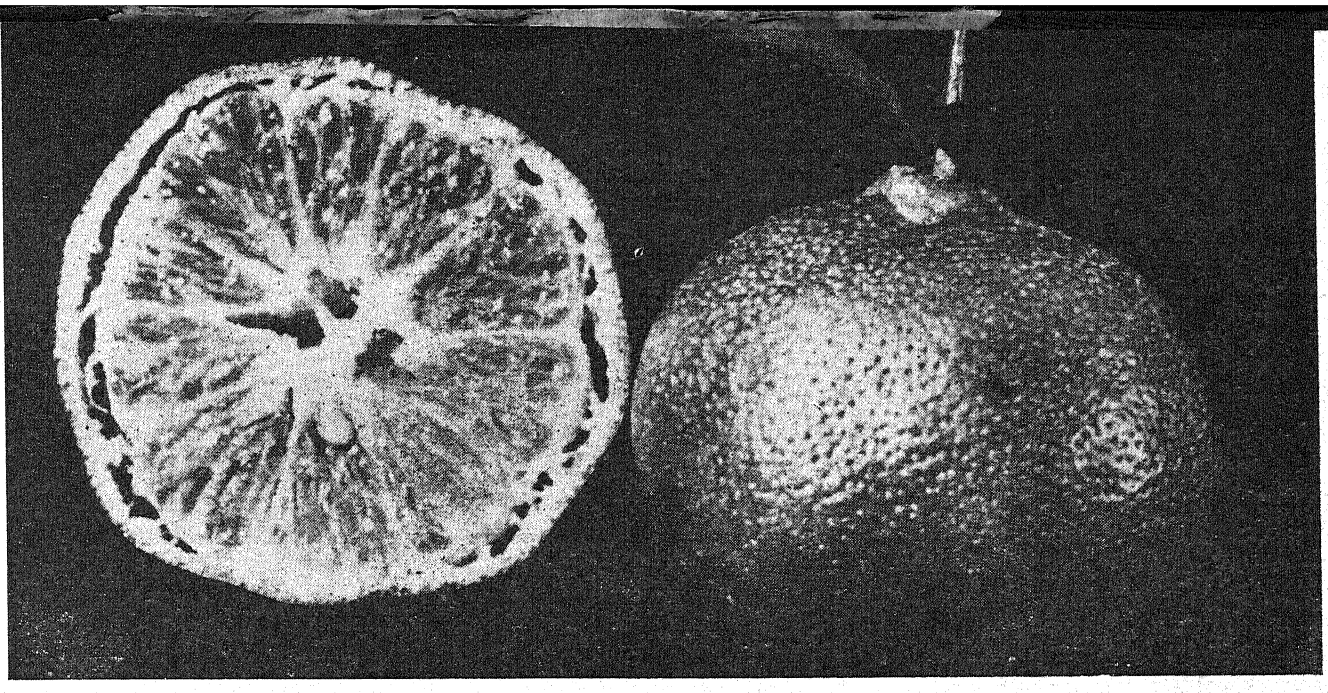
Percentage of success in budding of guava in the months of July, August and February

Method and time of budding	Bud-take (%)		Average time taken in sprouting after budding (days)		Buds sprouted and total success (%)		Survival after four months of transplanting (%)	
	Seedless	Safeda	Seedless	Safeda	Seedless	Safeda	Seedless	Safeda
I. *3rd July*, 1961								
A. Forkert	100	100	23	24	96	88	100.0	100.0
B. Patch	100	100	21	23	88	80	100.0	100.0
C. Shield	44	48	19	21	44	48	90.0	83.0
II. *3rd August*, 1961								
A. Forkert	100	100	25	26	76	72	89.5	94.4
B. Patch	100	100	23	23	64	56	93.7	92.8
C. Shield	32	28	20	22	32	28	87.5	85.7
III. *3rd February*, 1962								
A. Forkert	100	100	29	28	88	96	90.9	94.4
B. Patch	100	100	27	27	84	88	95.2	90.9
C. Shield	36	40	22	21	36	40	77.7	80.0

BUDS FROM TRANSPORTED STICKS

The possibility of propagating guava with the buds from transported sticks has also been examined. It is significant to note that the bud sticks dipped in wax can be retained in an excellent condition for budding upto seven days or even more after detchment if they are kept in moist sphagnum moss and wrapped with alkathene film. For this study, improved Forkert method of budding, as described above, was followed from 11th to 30th July (the best time for budding of guava). The data obtained revealed bud sprouting up to 92 per cent and survival after transplanting 100 per cent. The results are given in the table shown on Page 7.

The results clearly indicate that the budding of guava can easily be taken up on an extensive scale with transported buds as well, upto 14 days, if the sticks have been properly dipped in wax, wrapped in moist sphagnum moss, and alkathene is used for wrapping the buds after operation.



Emperor Mandarin : *Introduced from Australia, this variety bears profusely and gives good performance*

MANDARIN

CAN BE GROWN IN HILLS TOO

S. L. KATYAL and H. S. SABHARWAL
I.C.A.R.

MANDARIN (*Citrus raticulata* Blanco) is not the fruit of plains alone. It can be grown successfully in the sub-montane tracts also with elevations going up to 5,000 feet above sea level. Its cultivation has spread in the lower hills in the eastern Himalayas as well as western Himalayas in zones with rainfall varying from 30-100 inches.

In Assam and Sikkim, plantations of mandarins are found at elevations ranging from 800 to 4,000 feet with about 100 inches of rainfall. The crops raised in these areas generally are not given any artificial irrigation.

In North India, its cultivation is confined to Kangra and Hoshiarpur districts of Punjab, and Dhola Kuan and adjoining areas of Himachal Pradesh up to elevations of 2,000 feet above sea level. The mandarins are also found in wild form in Gharwal and Kumaon hills of Uttar Pradesh.

In South India, mandarins are grown in the regions of Coorg, Wynad, Nilgiris and Shevroy hills at elevations ranging from 2,000 to 5,000 feet above sea level.

VARIETIES

Nagpur Santra is the chief commercial variety grown in the country. The varieties named as Coorg Orange, Khasi Orange and Darjeeling Orange seem to be ecological forms of the former variety. Soil and climatic conditions are known to have a great influence on the quality of the fruits, their size and time of maturity.

Khasi Orange: This variety is mainly grown in Assam hills. The fruit is depressed, globose with usually obtuse base, occasionally with short neck. It is medium sized fruit with deep orange colour. It is a commercial variety of Assam and is known by various local names in different localities. In Shella region of Assam, it is called Shella Orange. Although this variety is grown as seedling trees, it can be suitably budded on Rough Lemon rootstock.

Coorg Orange: The fruit is oblate, globose in shape with medium size and bright deep orange colour. It is the most important commercial variety of Coorg and Wynad regions. It is mostly raised as seedling, but when budded with Rough Lemon is used as a stock for it.

Ladu Orange: This variety is grown on a smaller scale in the sub-montane districts of Uttar Pradesh. Its fruit is shaped in a semiflattened ball. The pulp is seedless and quite sweet. The trees grow vigorously and form a round and dome shape tree.

Emperor: Its fruit is large, globose, coarsely pitted and promi-

nently necked. Tree is medium to large, spreading with dense foliage, spineless and bears profusely. This variety has been introduced from Australia where it is budded on Trifoliate orange and gives good performance.

Satsuma: The fruits of this variety are oblate—spherical or slightly pyriform, and rough, medium sized, base even to slightly necked, becoming markedly necked on maturity, juicy with seeds none to few. The tree is small, spreading and nearly thornless. It is an early maturing variety and is resistant to frost and diseases like canker and gummosis.

Dancy Orange (*Tangerine*): Its fruits are oblate to pyriform, small in size with thin skin, furrowed and with orange red colour. The base of the fruit is sometimes evenly rounded to necked. The tree is large, nearly spineless and is prolific bearer. It is frost resistant, and to a certain extent resistant to some of the diseases. The main drawback of this variety is of smaller fruits and seediness.

In addition to the above varieties, Kinnow and Temple oranges are hybrids and deserve commercial cultivation in lower hills.

SOIL

Mandarins normally prefer light and porous soils with a good depth and rich sub-soil. Heavy soils with good drainage are also suitable. Soils with rock or hard pan in the sub-soil cause waterlogging and should be avoided. In Coorg, mandarins flourish in deep but well-drained red loamy soils. Sandy or gravelly soils, are quite suitable in the high rainfall areas like the Khasi hills in Assam and Darjeeling, as they are useful in draining away the excess water. Mandarin oranges are specially sensitive to high concentrations of salts. Soils and irrigation water containing large amounts of salts should, therefore be avoided.

PLANTING DISTANCES

Mandarins are planted in hill slopes by preparing terraces by contour method of planting. This method of planting has been found to be more suitable for all the hill regions in the country. The recommended distance from plant to plant varies from 18 to 25 feet according to the fertility of the soil. The richer soils need greater distance from plant to plant. The terraces should run parallel to each other one above the other across the slope of hills.

CULTURAL PRACTICES

Mandarins are usually planted as seedling trees. When propagated by vegetative means, budding should be adopted. Suitable rootsticks for each region have to be found out by trials. Rough Lemon is the common rootstock recommended so far.

The trees should be planted in February-March or in August-September. It is advisable to purchase the plants from reliable nursery in the beginning. The plants should be planted in pits 3′×3′×3′. Two to four baskets of farmyard manure along with 2 lb. of bonemeal and 5 lb. of woodash should be mixed thoroughly in the soil before planting the trees. After transplanting, a basin 4 feet wide is made around the plant and water given copiously. Any water sprouts that may appear should be removed. The tree should be trained to develop a straight vertical stem about 1½-2 feet high with 3 to 5 branches in different directions. The trunk of the tree should be white-washed to protect it against sun-burn.

Manuring: The young trees should be manured at least once a year. One year old tree may be given a mixture of 20 lb. of farmyard manure and half lb. of castor cake. The dose may be increased by 10 lb. of farmyard manure and half lb. of castor cake every year. For matured trees, the practice of manuring the varies from place to place. 200 lb. of farmyard manure with 4 lb. of ammonium sulphate is a recommendation which is generally given to the orange growers. The application of farmyard manure should be made from December to January and the dose of ammonium sulphate should be given in two doses, once before flowering and again after the fruit is set. Areas receiving heavy rainfalls should be givin 15-30 maunds of lime per acre after every few years.

Irrigation: Although it is possible to get crops of mandarins without irrigation in areas like Coorg, and Assam due to heavy rainfall, lack of irrigation during the dry season has been found to cause various diseases. It will be proper to have assured supply of irrigation water for raising the mandarin oranges. Irrigation should be so planned that the root zone does not get dry up. In the spring, conservative application of water should be given to promote good flowering and fruit set, but once the fruits have set in, irrigation should be given liberally. During maturity of the fruits, scarcity of water causes shrinking and drying of fruits. During winter, the irrigation may be given at two to three weeks' interval, while during summer, it may be given at one week's interval.

Pruning: The trees are trained in the early stages so as to form a strong framework with lowest branches from one and a half to two feet above the ground level. The branches that are obliquely inclined and are exposed to the sun should not be pruned. Only the upright branches and water sprouts should be pruned. It has been usually seen that branches which are on the sides of the tree bear profusely. The branches that crowd the centre should as such be pruned. Any suckers that arise from the rootstock should also be pinched away as soonas they appear.

PESTS AND DISEASES

Citrus leaf miner, aphides, mealy bugs, citrus psylla, thrips and mites are some of the pests which attack mandarin oranges from time to time. Effective control measures should be taken to check these pests. Citrus canker is a bacterial disease which is highly infectious and spreads from tree to tree. The diseased leaves and twigs should be pruned and destroyed. The trees should be sprayed with Bordeaux mixture (4 : 4 : 50) frequently. Mottle leaf or frenching is a leaf disease and is caused by the deficiency of zinc. It can be successfully controlled by spraying the new flushes of leaves with zinc sulphate (10 lb. of zinc sulphate and five lb. of hydrated lime mixed in 100 gallons of water) once a year when the season's new shoots have grown for about two months.

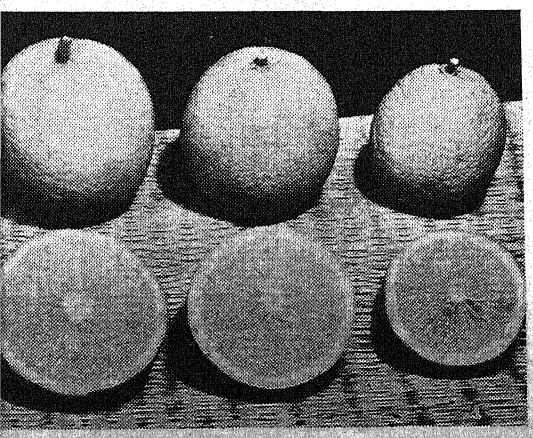
What's New in Horticulture

STORING FRUITS

SOME investigations on the problem of storing of perishable fruits were carried out at Agriculture College, Ludhiana, during the year 1961-62 on two species and three varieties of fruits, i.e., Blood Red and Valencia Late Oranges and Kagzi lime, with different concentrations of 2, 4-dichlorophenoxy acetic and 2, 4, 5-trichlorophenoxy acetic acid at room temperature. The fruits were cleaned, dipped in the growth regulator solutions, dried and wrapped in the polyethylene bags before putting into wooden boxes for storage.

It was observed that there was maximum rotting in case of Blood Red and Valencia Late Varieties of Sweet Orange when untreated fruits were wrapped in tissue paper, while minimum rotting was recorded in case of 100 ppm. concentration of 2,4-D. Further, it was noted that 500 ppm. concentration of 2, 4, 5-T resulted in the second highest percentage of rot, being lower than tissue paper (untreated) treatment alone.

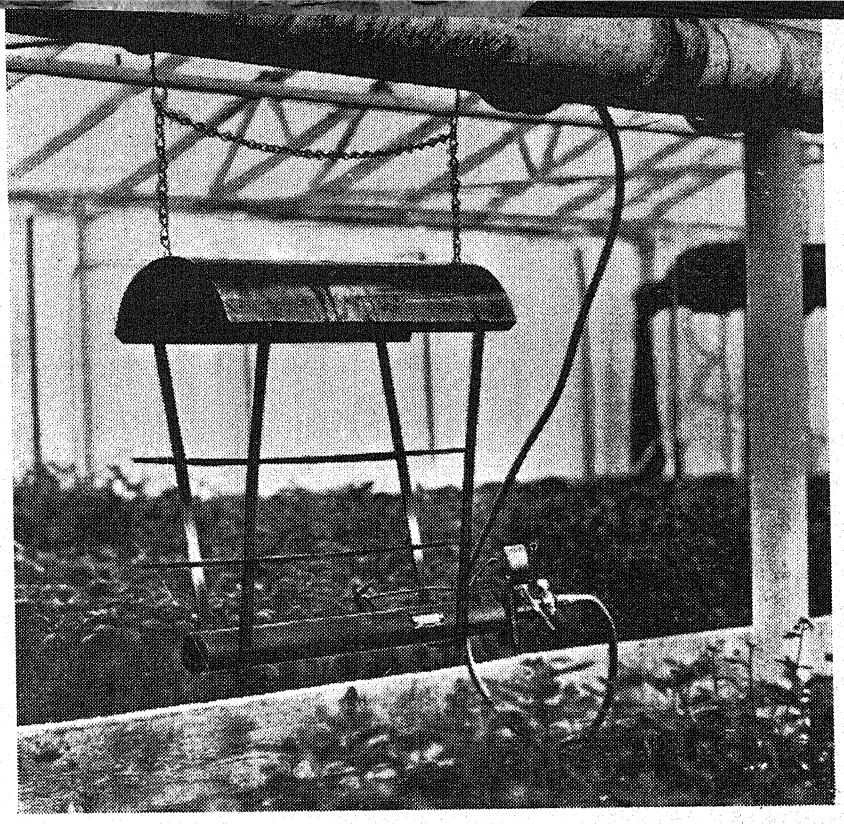
Appearance of Blood Red fruit after 60 days of storage. 1. Untreated fruit wrapped in tissue paper showing shrivelled rind; 2. Fruit treated with 100 ppm concentration of 2,4-D and wrapped in polyethylene bag; 3. Fruit treated with 1100 ppm concentration of 2,4,5-T and wrapped in polyethylene bag.



In case of Kagzi lime too, the wrapping in tissue paper proved equally harmful and increased rotting to the maximum. In this case, however, th 500 ppm. concentration of 2, 4-D proved helpful in reducing rot to the minimum which is contrary to that experienced in case of sweet orange. The effect of growth regulators on Kagzi lime was not very scintillating becuase the stalks (buttons) were dropped immediately after picking and during transit before the treatments could be applied.

It is apparent from the investigations that 2, 4-D at lower concentrations can be widely used for short period warm storage. More experimentation on temperature ranges, humidity control and lower concentration growth regulators shall enable commercial adoption of this pratice with great advantage to the trade.

—R.R. Kohli



A Maywick Co2 generator at West End Nurseries, Angmering, Sussex, England, burning Propagas Propane

MIST PROPAGATION FOR GREENHOUSES

THE technique of mist propagation is being increasingly adopted by amateur and commercial growers not only in Britain but in most countries overseas. It has many applications. It enables cuttings to be rooted easily in greenhouses, or indeed in frames in the open, and it is an excellent method of germinating seeds in pots or boxes on a greenhouse bench.

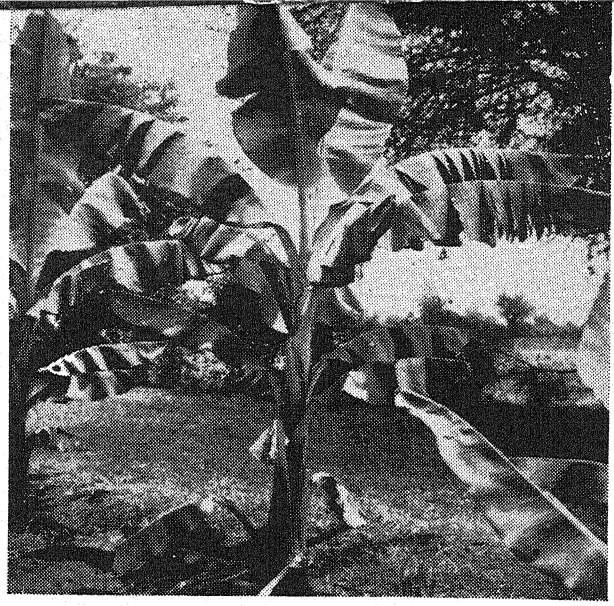
Briefly, the idea is simply that by keeping the surface of the leaves of the cuttings always covered with a film of moisture, they can never wilt, and therefore, they may be rooted in full sunlight; by this method cuttings are rooted much more quickly than of old, and indeed there are many cuttings which cannot be rooted by any other method.

An electricity supply is connected to a sensing device known as the

CONTINUED ON PAGE 29

WHY GUJARAT FARMER HAS A FANCY FOR BANANAS

BALVIR VERMA, JAMNADAS THAKUR and S. MISTRY



Six month old plant—Bombay Green

THE GUJARAT FARMER is getting more and more tempted to banana cultivation for it fetches him a handsome return of about Rs. 1800/- per acre. As a field crop it is more paying to him than most other fruit crops and cereals.

The main areas of banana cultivation in Gujarat are Baroda, Bhavanagar, Broach, Junagarh, Kaira, Kutch and Surat. Some important hints on banana cultivation as practiced in Gujarat are given below.

Soil and climate: Excepting saline soils, all the other soils are suitable. Medium black soils in Surat (Navsari-Billimora) are quite suitable for the growth of banana. Extensive sandy areas and large portion of black loam are also good for banana cultivation.

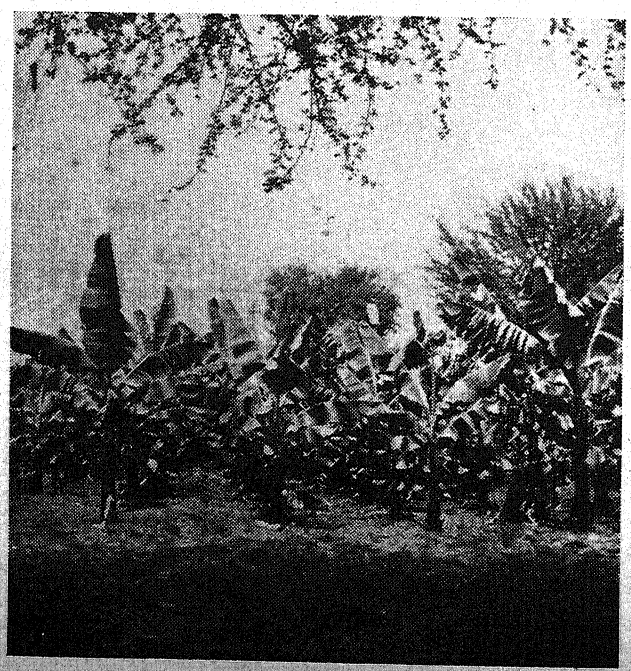
It is a tropical fruit growing luxuriantly between temperatures 10° and 40° C, with frequent rainfall or irrigation.

VARIETIES

The common banana varieties grown in Gujarat are, *Basrai*: Fruit is of yellow colour with brown spots. The plant is of dwarf type, gives 6-7 hands with 13 fruit per hand; *Bombay green*: (Harichhal or Lokhandi). The fruit is greenish yellow with no spots. The plant is taller than that of Basrai. The fruit is long and more delicious as compared to the Basrai variety; *Bankel*: This is grown for vegetable purposes.

Brinjal grown on the fringes of banana field

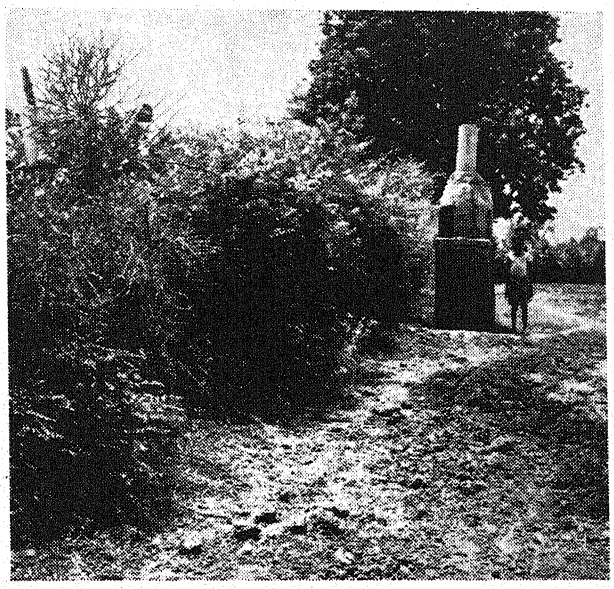
A banana field of Bombay Green variety
(Spacing—6′ × 6′)



CULTIVATION

Propagation: It is done from suckers with at least one sprouting bud removed after harvest. Well developed sword suckers are removed with their rhizome roots pruned flush with the surface of the rhizome. Pseudostem is also topped before planting so as to maintain a height of one foot from the top of the rhizome. Sword suckers with long narrow leaves are considered superior to broad-leaved water suckers.

Planting: Suckers are dipped in cow-dung liquid manure before planting. The old roots are scrapped with a sickle or a knife to hasten the growth of fresh roots. Spacing between plants is maintained at 6 ft. × 6 ft. In Kaira District, suckers are planted in flat beds, covering 6-8 plants length-wise and two plants breadth-wise. Planting is done in the monsoon season (June-July) in plough furrrows which gives better results than planting in pits ($1\frac{1}{2}' \times 1\frac{1}{2}' \; 1\frac{1}{2}'$). On fields having some slope, planting is done across the slope.



Take off stucture of underground irrigation for a banana field near a windbreak-cum-fence on the left

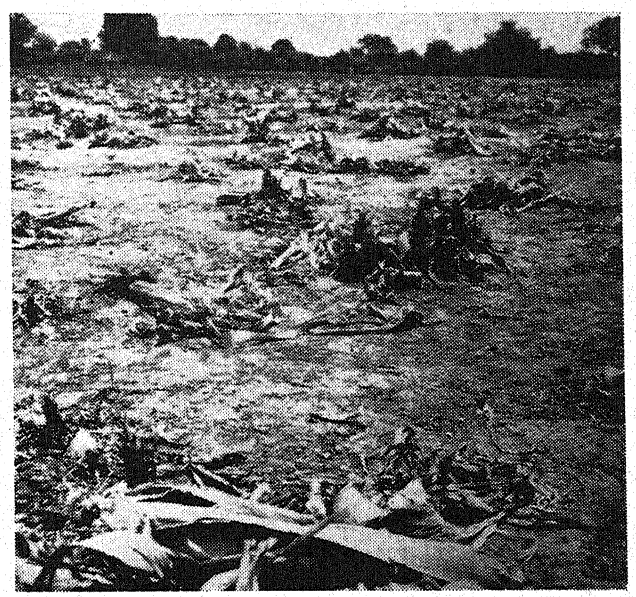
Manuring: The fields are given 40-60 cartloads of farm yard manure per acre, as a basal dressing. In addition to this, 200-300 kg. of nitrogen per acre is given in the form of Ammonium sulphate and castor cake. In some places, only $2\frac{1}{2}$ kg. of castor cake is given per plant in three doses of 3/4 kg. in the third month, 3/4 kg. again in the fourth month and one kg. in the fifth month. Some times, rotton crop of tobacco is also used as manure for banana.

IRRIGATION

The crop requires to be irrigated at intervals of 12 days, six days and 8-10 days during winter, summer and the monsoon respectively. In all 30-40 irrigations are required. In Gujarat, there is very good system of laying underground irrigation pipes. With a six inch pipe, it takes $1\frac{1}{2}$ to 2 hours to irrigate one acre area. The underground pipes have got small masonry structures at distribution or take-off points.

WIND-BREAKS FOR BANANA

The crop needs protection from hot and stormy winds, which tear the leaves. The main function of the leaf, which is to synthesise carbohydrates is affected. This results in poor production of fruit. The local cultivators use a single mixed windbreak consisting of Shevri (Sesbania aegyptica), Castor (Ricinis communis), Wild Bor (Zizyphus oenoplia), Babul (Acacia arabica), Khejri (Prosopis specigera), and Thor (Euphorbia spp.). The wind break may be about 10 ft. high.



Crop residue left after banana harvest. The residue is decaying and would be incorporated into the soil.

AFTERCARE

As soon as pistillate flowers have set fruit, the remainder of the inflorescence should be removed. This improves the appearance of fruit. In District Kaira, dry leaves are used to protect the fruit against heat of the sun. Desuckering is done and heavy branches are given props.

HARVESTING

Flowering starts 9-10 months after transplanting. Each flower cluster is enclosed in a bract. When flowers mature, the bracts fall. Female flowers become the fingers (i.e. fruit). It takes $2\frac{1}{2}$-4 months after shooting of the arm before the fruit becomes ready for harvesting i.e. a total period of 13 to 15 months after transplanting. Bananas are picked green and ripened artificially in heaps or in underground pits plastered

with mud. They are kept there for 36 to 72 hours during summer and 144 to 168 hours during winter. Ripening imparts golden yellow colour to the fruit.

Conservation Farming: For soil and water conservation the following practices are adopted.

(a) *Cover canopy*: In the first year, sunhemp or guar is sown in between the plant lines during June, which protects the interspace from the beating action of rain during the rainy seasons. The leguminous crop is then used for green manuring the banana crop. During the following rainy season, banana leaves develop enough canopy (70 % to 80%) to protect the soil.

Organic matter and Nutrients: After the banana crop is harvested, the residue is allowed to rot in the field. In addition to this, the lower leaves periodically fall down in the field; it may be 10-12 times during the growth period. The total quantity of organic matter added in the above forms has been found to be approximately 6,300 kg. per acre, contributing 80 kg. nitrogen, 180 kg. phosphoric acid and 75 kg. potash per acre.

Conservation rotations with Banana: The following rotations have been found to be beneficial.

(i) Sunhemp (gm) — Banana — Sunhemp (gm) — Kalkatti Tobacco. (ii) Sunhemp (gm) — Banana — Sunhemp (gm) — Wheat. (iii) Sunhemp (gm) — Banana — Sunhemp (gm) — Sundia jowar.

ECONOMICS OF BANANA CULTIVATION

The average cost of cultivation for banana as well as the income per acre, assessed in a number of fields, are given below:

	Description	*Expenditure per acre* Rs.
1.	Land revenue	7.00
2.	Seed	120.00
3.	F.Y.M. groundnut cake and Ammonium sulphate	282.00
4.	Cultivation, planting, interculture etc.	128.00
5.	Irrigation charges	1,005.00
6.	Harvesting, stump removal, weighing and transport (5 miles)	55.00
7.	Watch and Ward	60.00
	Total	1,657.00

Average fruit yield—20,000 kg./acre Gross income at Rs. 3.50 per 20 kg.=Rs. 3,500.00 Net income= Rs. 1,843.00.

Dania Kalimpong matures early and yields high

S.S. CHATTERJEE
ICAR, New Delhi
and
S.K. MUKHERJEE
I.A.R.I., New Delhi

Plants artificially blanched when cultivated as spring-summer crop (Fig. 1)

CAULIFLOWER is an important popular winter vegetable in India, especially in the north. Although the crop is of exotic origin, a large number of varieties have been developed by the seedsmen and Government nurseries for growing under Indian conditions. Previously, the seeds of the late varieties were used to be imported from the European countries for cultivation in this country. Consequently, there were few standard varieties available in the country when the work was undertaken in 1953 by the Department of Agriculture of the West Bengal Government for evolving suitable varieties, seeds of which could be raised under Indian conditions. Investigation was undertaken to assess the adaptability of the different varieties and also their seeding behaviour at Kalimpong (4,000 ft. in the Eastern Himalayas).

Intensive studies with the Indian and imported varieties have resulted in the selection of a superior strain—*Dania* Kalimpong. The variety was originally introduced from Denmark (developed by M/s. Dachnfeldt, Odense). After rigorous selection on the basis of economic characters like yield, compactness, size, colour, period of maturity, etc., three lines were isolated. Inbreeding of these lines resulted in the gradual degeneration of two lines by the third generation, while

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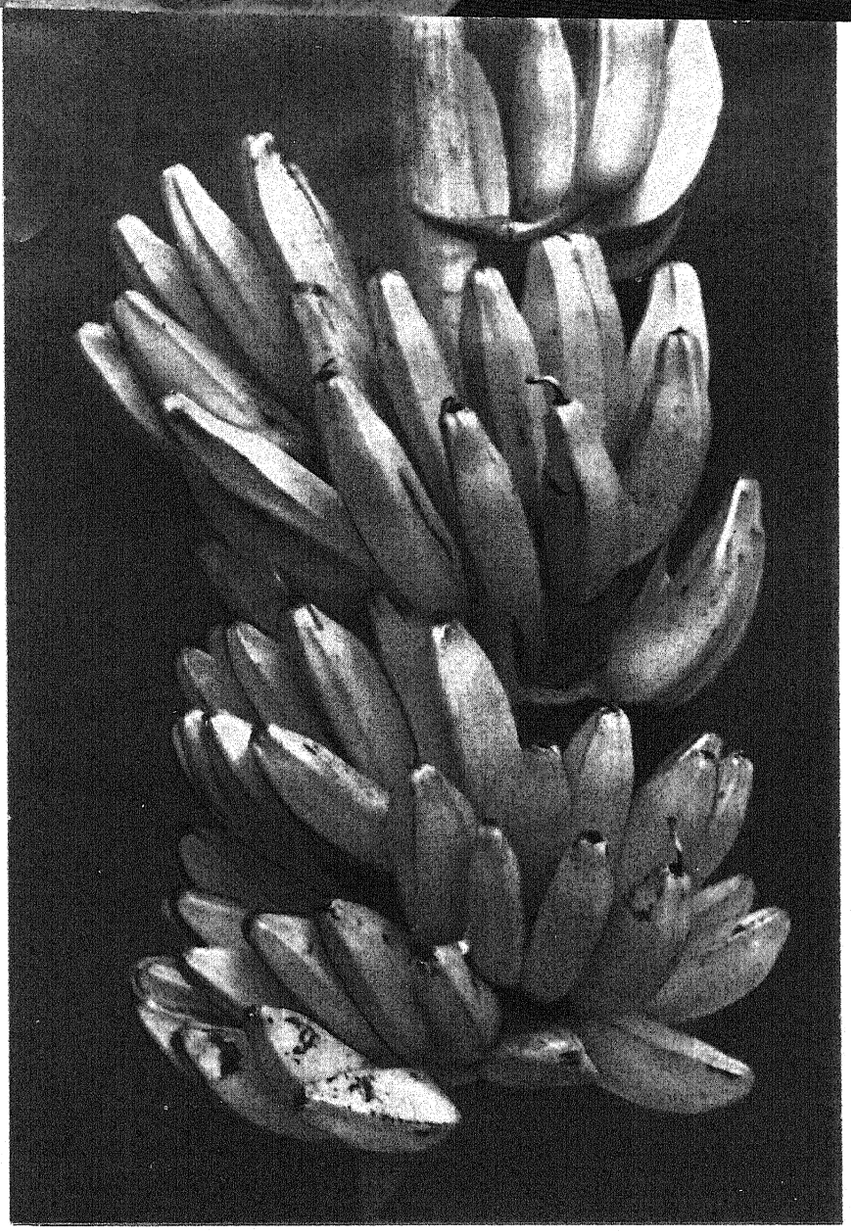
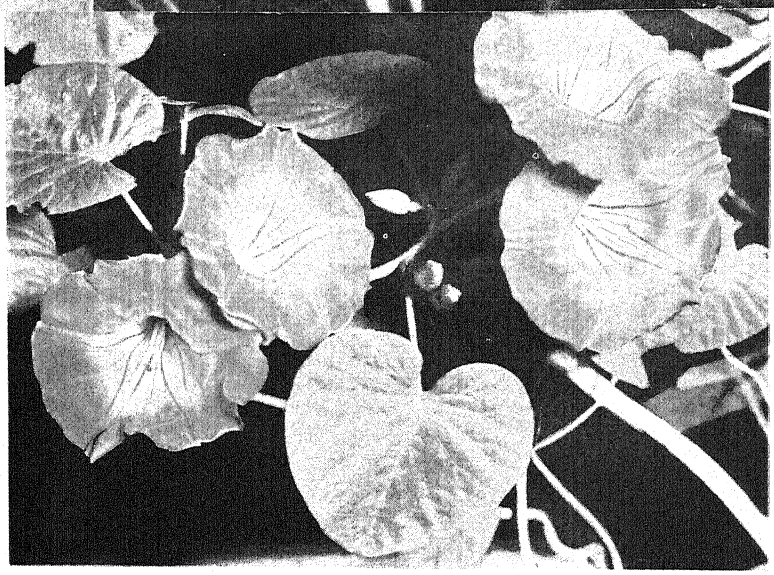
BANANA IN GUJARAT

A popular vegetable variety grown in Gujarat



DANIA KALIMPONG

Cauliilower heads not artiticially blanched when grown as spring-summer crop showing yellowishness



BEAUTIFUL IPOMEAS

Many creepers grow and persist for a number of years. These are the perennials and they are valued because once they have established themselves, they do not need very much care. Amongst the creepers, few can stand comparison with the Ipomeas which comprise a wide array of beautiful ornamental annuals and perennials. For quickly making gay a small space of trellis or a bare wall, and for covering unsightly objects it is difficult to find anything better than Ipomeas which are raised from seed and grow quickly. The top photo alongside shows a new variety *Strictocardia beraviensis* recently introduced at Lalbagh gardens, Bangalore. The lower photo shows another variety popularly known as 'Flying sauser'.

GLOXINIA

Gloxinia : These are attractive tuberous plants which bear large flowers of rich exotic colouring and have soft grey-green oval leaves. Plants can be brought to flower in the tropics but require considerable skill and close attention. These can be successfully grown in pots in a green-house. The plants like a rich fibrous soil. The bell-shaped flowers of Gloxinia are very showy and stand well above the foliage.

TWO BEAUTIFUL IPOMEAS

M. DWARAKANATH SHARMA
Floriculturist, Lalbagh, Bangalore

WHETHER in variety or in popularity, very few creepers can stand comparison with the Ipomeas which comprise a wide array of beautiful ornamental annuals and perennials. Among the annuals every one is familiar with the old but still favourite, the Heavenly Blue, a morning glory which has in recent years given rise to many new varieties of astonishing range of colours, red, pink, rose, blue, lavender and pure white, and also of varying sizes, and forms including doubles, frilled and streaked. Every year, newer shades are being introduced to add to the variety. Among the perennial Ipomeas the yellow coloured *Ipomea tuberosa* and sparkling crimson red *Ipomea thorsfelliae* with palmate leaves which are among the most beautiful Ipomeas for their magnificent and heavy blooms are highly popular in the gardens of Mysore. An account of two new Ipomeas, highly commendable for our gardens and are of recent introduction is given in this article.

Ipomea beraviensis (*Syn*: *Stictocardia beravinsis*)

This beautiful perennial light creeper from Ceylon was introduced into Lalbagh gardens under the popular name "Candy King". It is a native of Africa. An extremely fast grower with wiry and thin stems; it spreads rapidly over a large space in a short time unlike the other ornamental perennial Ipomeas. It bears funnel-shaped flowers of striking colour in clusters at the axils of the leaves during the rainy season; a few flowers can always be found for the best part of the year. The colour of the expanded portion of the flower is brilliant red and velvetty and the tubular portion is yellow. From the base inside, five pairs of prominent red stripes run through the length of the tube and from the throat narrow down to the edge merging with the expanded red portion of corolla. In between these prominent stripes indistinct streaks of pink colour are seen. The expanded portion of the flower is three to four inches in diameter,

CONTINUED ON PAGE 36

GLOXINIA
that bears gorgeous flowers

K. ACHUTHA KURUP
Nilgiri Agri-Horticultural Society, Ootacamund

Gloxinia is a greenhouse plant very much esteemed for its gorgeous flowers and like Begonia and Cyclamen it is generally grown in colder regions of the world.

Gloxinias (Gesneracese) of florists owe their parentage to Siningia Speciosa, the generic name being given in honour of William Sinning, a gardener at the University of Bonn. All modern varieties of Gloxinia have orginated from this species which is a native of Brazil. They are tuberous-rooted and grow upto a height of about a foot. They produce bell-shaped large flowers. The flowers are extremely showy and stand well above the foliage. There are erect-flowered and drooping-flowered varieties, the former being most popular. Gloxinia strains are available in varying colours of white, pink, red, blue and many intermediate shades.

PROPAGATION

Gloxinia is propagated by seeds and stem or leaf cuttings. Although seeds form a ready means of obtaining stock, they are not easily available in the country.

The tubers generally produce a number of shoots during May-June and the cuttings taken from these shoots are used for propagation. The cuttings are inserted in a rooting medium containing plenty of sand and kept in a warm atmosphere, partially shaded. Small tuber will be formed in 2 to 3 months at the bottom of each cutting.

The most general and rapid method of propagation is, however by leaf cuttings. Fully matured leaves are taken in summer with a portion of the stalk and they are inserted in pots containing an ideal rooting medium. It is a common practice to cut the underside of the leaves at a few places along the midrib and lay in flat on the soil for obtaining tubers at all the points where cuts are made. The small tubers which will be eventually formed from the cuttings can be grown afterwards in everyway as recommended for old tubers.

CULTURE

Gloxinia should get abundance of air and high humidity for satisfactory growth. Plants love shade and for that they may be shaded from direct sunlight. A considerable amount of warmth is also necessary for their successful growth.

When the plants are raised from seeds, the seeds have to be sown about the middle of October in

CONTINUED ON PAGE 27

DANIA KALIMPONG

CONTD. FROM PAGE 16

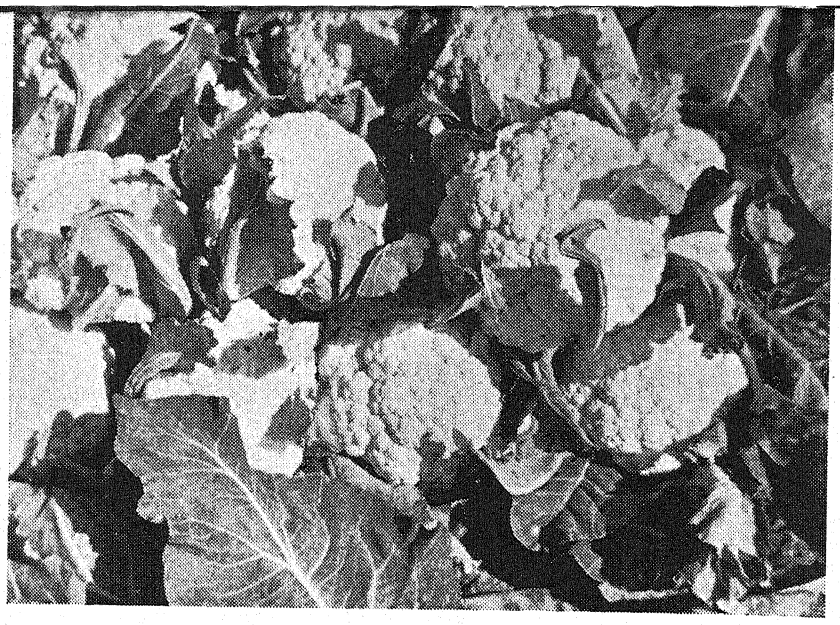
the third line maintained its vigour and yield even after four years of selfing. This third line has been developed as the present variety.

HIGH YIELD—EARLY MATURITY

In the varietal trial for three years at Kalimpong, this strain has given on an average fifty percent increased yield over the locally cultivated main season variety (known as American) besides being superior in quality. In the plains of West Bengal, both at the Government Farms and in the cultivators' plots in various cauliflower growing localities, this new strain has always given higher yield varying from 20 to 80 percent, than both the local and the well known Snowball variety. Even in a varietal trial at I.A.R.I. in 1960-61, this strain was statistically at par with the Snowball-16 and other late Snowball varieties, but in all these locations the strain was earlier in harvest by 10-12 days than the late Snowball types. From these results, it was evident that the strain would be very suitable in localities where the winter season is comparatively short and mild. In areas with long growing season and severe winter, it would fit nicely in-between the acclimatised main season varieties like Giant Snowball (Punjab), Patna and Banaras types (distributed by nurseries) and late Snowball varieties like imported Snowball, Snowball-16 (IARI), etc. It is thus not only suitable for West Bengal, but also for places like Punjab in the north.

CHARACTERS

The plants are short, stocky but vigorous, and the size of the curd is much bigger as compared to the size of the plant. The outer leaves are dark green and wavy at the margin and the inner leaves curved inwards affording moderate blanching. The average size of heads is 16.2 cm. (6.5″) Weighing 1.1 *Kg.* (2.5 lb.) which are white and compact (Fig. 2).



Well-grown Dania heads (fig. 2)

CULTIVATION

Seeds are sown in the nursery during September in the hills and from mid-September to mid-October in the plains; generally 425 gm. (6 oz. per acre) of seeds are required for planting one hectare of land. The seedlings become ready in about 4-5 weeks for transplanting in well-prepared and well-manured land. For the purpose of manuring, 50 to 60 cart-loads, (20-25 cart loads per acre) of well-rotted farm yard manure or compost and 285 Kg. (250 lb. per acre) of superphosphate per hectare are applied while preparing the land. After transplanting, 340 Kg. (about 300 lb. per acre) of ammonium sulphate is applied per hectare in two doses as top dress.

In the hills, and in the plains of West Bengal, the best transplanting time has been found to be October and mid-October to mid-November respectively. At altitudes varying from 3,000 to 5,000 ft. when transplanted during early December, it produces beautiful heads during spring-summer when good cauliflowers are scarce in the market. The variety is moderately self-blanching. Hence, it may be necessary to protect the colour of heads from hot sun during this season by artificial blanching (Fig. 1). Hoeings are absolutely necessary to keep down the weeds and to loosen the soil, the number of hoeings may vary from three to four during the full growing period. As the plants are quite stocky, a spacing of 45 cm. × 45 cm. ($1\frac{1}{2}' \times 1\frac{1}{2}'$) has been found to be optimum. The yield depends on the number of plants and generally varies between 25 to 30 metric tons per acre (10-12 tons per acre).

SEED PRODUCTION

Investigations have shown that although the seeds of this variety can be raised in the hills without much difficulty, it is not possible to produce them in the plains. For producing seeds in the hills, it is grown as a commercial crop by transplanting the seedlings in October. The heads are ready for harvest by the late December to first fortnight of January. The plants with ideal characters are rigorously selected and kept *in situ* for their flowering. These plants come to bloom during mid-February and the pods become ready for harvest during April when the climate at Kalimpong is quite suitable for seed-drying under natural conditions. The yield of seeds has been found to be between 285 to 340 Kg. per hectare (250-300 lb. per acre).

FLYING FOXES POSE A PROBLEM TO ORCHARDISTS

BARBARA HENDERRON

The grey-headed fruit bat or flying fox

IN QUEENSLAND and New South Wales, it has been a long draw-out battle against the flying foxes which have been inflicting heavy losses on the fruit growing industry.

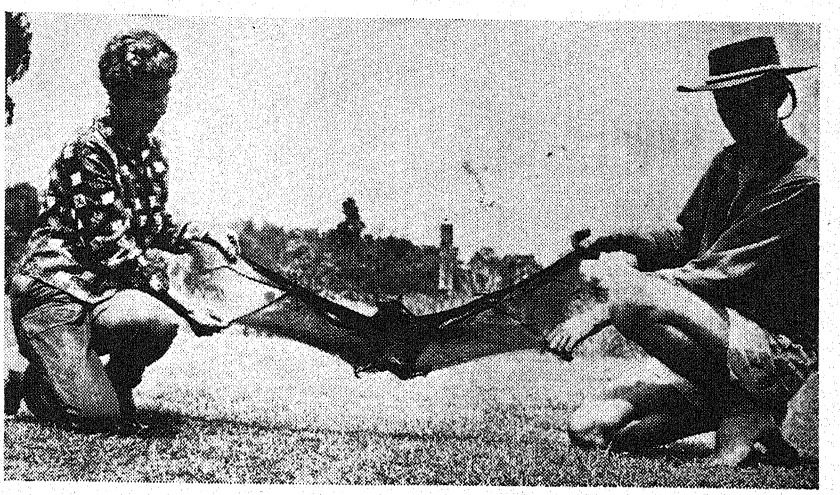
The seriousness of the problem was recognised, as early as, 1929 when all the Australian States joined the Australian Council for Scientific and Industrial Research in a project aimed at ridding the country of this pest.

According to F.N. Ratcliffe who was assigned this work, serious losses in fruit orchards could usually be traced to temporary disturbances in the local supply of the natural food of flying foxes. The foxes were found to cluster in huge numbers in mangrove swamps, groups often reaching 10,000 or more, or in rain forests where their number would rise to as many as 20,000 foxes in a camp.

THE GREY-HEADED FOX

There are four Australian species of flying foxes and out of these the Grey-headed Fox (*Pt. Poliocephalus*) probably accounts for 90 per cent of damage to cultivated fruit.

Mr. Ratcliffe's report affirms that the principal food of flying foxes of all species in Australia is undoubtedly Blossom. The foxes have been reported to feed on the Chinese Apple (*Zizyphus* sp.), a prickly shrub regarded as a pest, round Bowen, north Queensland; on the black apple (*Sideroxylon australe*), in New South Wales; the fruits of various palms (including the coconut in its early stages), grown in Queensland chiefly for ornament; and on the fruit of the tamarind (*Tamarindus indica*).



Australia has big camps of flying foxes some of them measuring 10 to 12 inches long and weighing about 2 lb.

FOOD OF FLYING FOXES

According to Mr. Ratcliffe almost all varieties of cultivated fruit—all pome, stone and citrus fruits (even lemons, Seville oranges and grapefruit), grapes, mangoes, bananas, figs, custard apples, paw-paws, grenadillas, passion fruits, persimmons, loquats, guavas, and mulberries are attacked by flying foxes. Once hungry, the flying foxes apparently feed on anything vegetable succulent. They are known to eat young shoots and leaves of Eucalyptus, and of *Populus fustigiats*; the buds of paw-paws flowers of the sugar banana, the mango and the coconut palm; ripening maize, the berries of the pepper tree (Schinus mille); and, unripe and half formed fruit, even of citrus varieties such as lemons, kumquates and pineapple.

The foxes on the whole prefer stone fruits, especially the sweet ones and softer varieties of peach and apricots. Figs, persimmons and loquats may also be sought after.

Flying foxes do not have large apetite but unfortunately the amount of fruit devoured cannot be equated with the damage done. For every fruit eaten many are knocked down, or rendered unsalable due to scratches and bites.

CONTROL

The method which Ratcliffe finally recommended was organised shooting, but he made it a point that to achieve results, the shooters must know the type of fox to despatch. An attack directed specially against the Grey-headed Fox could prove most useful, he suggested. The method of control now being followed by the New South Wales Department of Agriculture centres round a nightly gun patrol, (until about 10 P.M.) followed by the setting of acetylene 'exploders' timed to sound at intervals of from one to 15 minutes, but with a limit of 5-7 preferred.

(*Photos*: Harry Franca)

Mango varieties at the All India Mango Show held at Patna

NEWS ROUNDUP

Biggest Ever Mango Show

More than 40,000 people visited the third All India Mango Show at Patna, held in the third week of June, 1964. Organised by the Indian Council of Agricultural Research, this was the largest mango show wih 914 entries and 2,656 exhibits. Every variety of the King of fruits was on display—melon-like Benishan, Jehangir of Andhra, the Ilaichi of Bihar, Langra, Bombai, Fazli, Krishubhog, the Himsagar of West Bengal, and the Fernandine of Goa. The Show which was held in the newly constructed hall of the Patna University was an array of the most luscious beauties and of the most delicate aromas to tickle the appetites of connoisseurs and gourmets alike.

Besides the fruit, various mango products, home made and produced on a commercial scale, formed a separate section of the Show. An astonishing variety of squashes, mango juices, preserves canned mango slices, pulp, pickles and mango powder was on display.

In all, 12 States had entered the Show, and 111 prizes were awarded. Bihar knocked away 51 of them; the State was adjudged the champion as it won maximum number of prizes. Bihar was also awarded a special running shield for securing the highest aggregate score in all classes.

Dr. Ram Subhag Singh gave away the prizes.

RECORD CASHEW EXPORT

THE exports of cashew kernels from India during 1963 have registered an all-time record of 53,400 tonnes, earning foreign exchange of about Rs. 22 crores. This marked an increase of about seven thousand tonnes valued at Rupees three crores over the exports during 1962.

The compulsory quality control of cashew before export, which was started from April 1963, has contributed a great deal to the considerable increase in exports.

FRUIT PRESERVATION LABORATORY

A fruit preservation laboratory at the Central Horticultural Research Station at Kirtipur-Kathmandu set up and equipped under Indian-aid was Inaugurated by Her Majesty, the Queen of Nepal. The Laboratory is a part of the horticultural development plan of Nepal and will be used for training and research purposes. On the basis of the results achieved there, the Government intends to construct a canning factory at Dharan in 1964.

AGRICULTURAL FAIR NEXT JANUARY

A national agricultural fair will be held in Ahmedabad in January, next year. This will be the second fair of its kind to be held in the country. The first fair was held in Madras in 1962. Several foreign countries including Germany, Russia and Japan have already expressed their desire to participate in the fair.

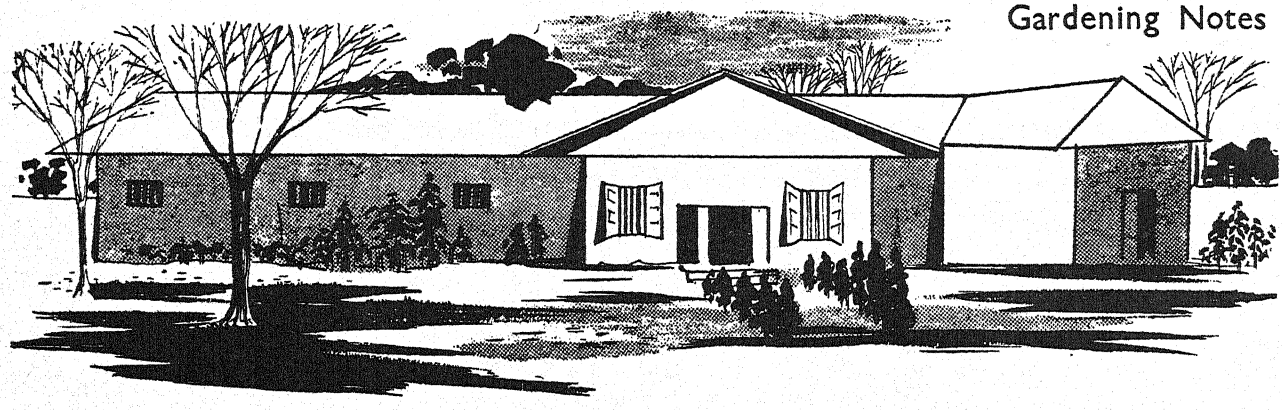
Dr. Ram Subhag Singh presenting the shield at the Patna Fruit Show

MINIATURE ROSES

(October-December)

WITH the cessation of rains, the planting season starts in the garden. Most of the winter annuals, bulbous plants and roses are planted during September-October in Northern India. Although the Hybrid Tea, Floribunda and Polyantha roses are familiar to many garden lovers and are grown commonly, the Miniature or Fairy roses have not attracted much attention in our country. With their dwarf and compact habit, long and profuse flowering, wellshaped small dainty blooms and ease in cultivation, the Miniature or the Fairy roses are ideally suited for growing in small home gardens. can also be grown as standards, two to three or ten inches tall, the latter are preferred for growing in pots. The taller standards (2 to 3 feet) are best grown along the garden paths and between two beds or in the centre of a bed of miniatures. While grouping plants in beds, it is necessary to have harmonious colour combinations but sometimes contrasting colours like red and white or deep orange and yellow are also pleasing when put together. The height and vigour of plants should also be taken into consideration. The miniature roses are also useful for growing in cement planters which are generally constructed on the outside boundary walls.

The fairy roses can be used for



These days when the space available for home gardening is generally small it is necessary to grow those plants which are small-sized and preferably perennial in habit requiring little care in their maintenance.

The Miniature roses are usually grown in small pots, vases, troughs, tubs or window-boxes. They can also be planted in small beds and rockeries and are ideal for a dwarf border, edging, low hedge screening. In small gardens, they are best planted along the paths, in front of a low green hedge, against the background of a small shrubbery, on a verandah or in the small sunny courtyard. The climbing miniatures can be trained beautifully on small arches, trellis or screen, upto a height of about 3 to 4 feet. These indoor decoration when grown in pots, vases, or troughs and placed on windowsills, shelves, table or trolley. They look very attractive in light coloured grey or blue and white porcelain or stone vases, bowls or troughs. For keeping indoors the potted roses should be brought inside when the flower buds appear on the plant and these plants must be removed frequently outdoors for a few days before bringing them again in the room. It is always a good practice to have a duplicate set of these plants so that these can be brought inside or taken outdoors alternately. The miniature roses are also ideal for growing in roof or terrace gardens. They are also excellent as cut flowers and can be used effectively in artistic and exquisite flower arrangements.

IMPORTANT VARIETIES

A few outstanding varieties are: Baby Faurax (pale lavender blue), Baby Gold Star (golden yellow), Baby Masquerade (yellow turning to pink and red), Cinderella (shell-pink), Coralin (red orange), Cricri (salmon Pink), Little Bukaroo (velvety red), Perla de Monserrat (rose pink), Pour Toi (cream white), Prince Charming ('scarlet crimson), Mr. Bluebird (lavender blue), Rosina-also known as Josephine Wheatcroft—(golden yellow), Simple Simon (rose pink), Sweet Fairy (pink), Tinkerbell (rosy-red), Tom Thumb (crimson) and Twinkles (white). The climbing miniature are Clg. Jackie (yellow), Clg. little Buckaroo (bright red) and Clg. Pink Cameo (rose pink).

CULTIVATION

The best time to plant the miniature roses is during September-October, but they can be planted upto February. A sunny location and well drained soil are important for their successful raising. The beds may be rectangular, circular, crescent-shaped or oval. Sometimes the dwarf varieties may be grown along the edges of the beds of the regular Hybrid Teas and Floribundas. The distance between plants may be about 9 to 12 inches while the rows are 1 to 1½ feet apart, varying a little with different varieties depending upon their vigour and growth.

CONTINUED ON PAGE 27

YOUR GARDENING PROBLEMS

Q. 1. What is the proper time for sowing of Simla Mirch near about Delhi for getting a high yield ?

2. Which varieties of grape-vine tried at the I.A.R.I., New Delhi, would be most suitable for growing in my area ? The probable time of ripening and average yield per vine of the varieties recommended may also be given in each case.

—R.C. Sharma
C.R. College, Rhotak, Punjab

Ans. Capsicum or Simla Mirch plant is highly susceptible to post injury and the plant also does not thrive well in very hot or rainy weather. The fruit set is very poor in extremely hot weather of sotting high in rainy season. The crop has therefore to be raised in such a manner so as to get maximum harvest before hot summer sets in. The right way to start is to raise the seedlings in nursery during winter months under protection. The seed is sown in early part of November. The seedlings will be big enough by the end of December when 'Sarkanda' coverings may be provided either on the northern side with an incline of about 60 degree or covered at night and uncovered in the morning. The seedlings should be transplanted as early as possible. The transplanting should preferably be done on the southern side of edges running east-west.

Varieties recommended :—

i. **Pusa Seedless :—** Bunches small to medium; ripening uniform; berries light-green; Seedless, very sweet; T.S.S. upto 22%; cropping medium; Av. yield/vine about 16 kgs.

ii. **Gros colman (pusa) :** Bunches medium to large; ripening uniform berries greenish yellow usually with one seed per berry; sweet (T.S.S. 18%), Av. yield/vine about 18-20 kgs.

iii. **Bharat Early :** Bunches small to medium; ripening uniform; berries yellowish green with three seeds per berry; very sweet (T.S.S. 18-20%). Picking season third to fourth week of June; Av. yield per vine about 18 kgs.

iv. **Black prince :** Bunches small to medium; ripening uniform; berries deep red to almost black mostly with one seed, sweet (T.S.S. from 17-20%); picking season third to fourth week of June; Av. yield per vine 8-10 kgs.

Gardening Notes

CONTINUED FROM PAGE 26

At the time of preparation of beds, mix one part well-rotted cowdung manure thoroughly with two parts soil and add about two ounces of bonemeal or superphosphate per square yard. It is often useful to add 5 per cent BHC and 5% DDT in equal proportions or 5 per cent Aldrin dust at the rate of one ounce per square yard to prevent the attack of insects like white ants and Chafer grubs.

The plants are propagated from seeds, cuttings or budding. In our country seeds of miniature roses are not available and generally the plants are raised from cutting or budding. Cuttings can be taken in July-August or in October at the time of pruning. For budding, the Edward rootstock is used but some dwarf varieties when budded may become robust in growth. In such cases it is better to propagate them from cuttings. The budding is done between December and February.

—VISHNU SWARUP

GLOXINIA

CONTD. FROM PAGE 21

pans filled with a soil mixture composed of finely sifted loam, leaf-mould and sand in equal proportions. Sow the seeds evenly and cover them with finely silted soil and press slightly. Moisten the pan by holding it up to the rim in water until the soil is fully wet and then allow to drain off for sometime. Keep the atmosphere fairly moist and stand in a temperature of 20°C to 25°C. The seeds will germinate in two or three weeks and as soon the seedlings are larger enough to handle pick them out about an inch apart in shallow pans using a medium similar to that in which the seeds were sown. Give shade from direct sunlight and a warm moist condition throughout the growing period.

As the plants grow, move them singly into small pots and encourage growth by judicial management.

Consequently, when they become large, again shift them into 8" pots. The best soil for potting is light mixture made up of 2 parts of sifted loam and 1 part in each of compost and leafmould with a good proportion of silver sand added.

Given correct treatment, such seedlings will form healthy plants and will flower in 5 to 7 months. The summer is the natural flowering time for Gloxinia. But it would continue in bloom till the end of autumn.

LORANTHUS

A Deadly Flowering Parasite

P.N. NARULA
and
P.S.L. SRIVASTAVA
Botanical Sub Station, Pusa (Bihar),
Indian Agricultural Research Institute

Branches of the parasite, LORANTHUS, flourishing on a mango tree

DENDROPHTHOE (Loranthus), locally known as *banjha* in Bihar is one of the most common flowering parasites, that attack other host plants of their own kind and cause serious economic losses to Orchardists. Apparently, less destructive it does not kill the trees outright it definitely affects the bearing capacity of the trees. The favourite tree of this parasite is mango but it has been spreading its tentacles on other plants too. A wide range of the host plants have been observed to fall victim to this parasite at Pusa (Bihar). Almost all the fruit trees such as the mango, guava, pomegranate, citrus, bel, custard fruit and sapota are victims of this parasite. In addition to these, it also attacks some other trees which are of great economic value.

THE PARASITE

The parasite is a small shrub with slender branches bearing opposite olivaceous leathery leaves with short petioles. The flowers yellowish red or deep orange in colour are borne in the axiles of the leaves, in typical raceme fashion. The berries, which appear in abundance during February/March and September/October, two or more times a year, are rosy red in colour, and oval in shape. The seeds are sticky which enables them to cling to the bark. They are carried from one plant to other trees by fruit eating birds, squirrels and wind. By the time the berries acquire slight tinge, the epicarp soften; these are swallowed by birds and are later thrown out along with the faecal matter on the same branches or on branches of different plants. The seeds, on germination, produce disc-like appresorium from the centre of which the suckers penetrate the tissues of the twig and establish connection with it. The point where the host plant and the parasite meet exhibits unusual swelling which is a characteristic feature of the parasite. Once it establishes its hold on a branch, the parasite starts spreading at an alarming rate from branch to branch and to neighbouring trees.

THE DAMAGE

The parasites rob the host plants of their food and lower their fruit bearing capacity. The affected branches get weakened, stunted, deformed and suffer greatly in growth. The leaves and inflorescences on that particular branch are shed off and finally the branch dwindles away. The tree becomes smothered by the parasites clumps; they feed on the life blood of the host, sap its vitality, hinder its healthy growth. Prolonged infestation can completely destroy the whole trees.

CONTROL

Though the parasite is perennial, it can be destroyed very easily during the first week of its life. The longer they are allowed to grow, the greater will be the damage to the plant. The only control measure is to cut down all affected branches of the tree and burn it in the prime of its life span. Constant vigilence is, therefore, needed to keep off the trees from the menace.

What's New in Horticulture

FROM PAGE 13

"electronic leaf", and, so long as a film of moisture lies across the two contacts, nothing happens. But when this film evaporates, which it does at the same rate as that of the moisture on the leaves of the cuttings, the contact is broken, a transistorised relay comes into play and actuates solenoid valve, allowing a short burst of fine spray to escape from the mist nozzles placed above the cuttings or boxes of seeds. The sensing device is, of course, placed among the cuttings, and as soon as a film of moisture again forms between the two tiny electrical elements, the current is switched off, and the spray ceases.

CARBON DIOXIDE INJECTS VIGOUR

Yet another new technique has been developed and is becoming very popular—the addition of small amounts of carbon dioxide to the air of the greenhouse. Plants need only very small quantities of carbon dioxide in the air, but if the quantity is not present, growth will be poor. By supplying quite tiny amounts of Co_2 during the winter, most crops gain considerably in weight, or, as in the case of flowering plants, in size of bloom. Chrysanthemums have been found to contain many more petals, and thus to be far more valuable, when a correct amount of Co_2 is supplied.

Home Made Products of MANGO

RAJENDRA KUMAR SHUKLA

WHO WOULD NOT LIKE to enjoy the exciting flavour of mango all round the year. In season, the fruit is available in plenty and much of it goes waste. These can be converted into various produces and preserved for consumption during off-season when the fruit is scarce. Mango canning is quite simple and does not require much investment. The methods of preparation of a few produces are described below.

MANGO PRESERVE AND CANDY

Excellent preserve and candy can be prepared from firm whole fruits or slices of under-ripe mangoes. After peeling, cut fruits in small pieces but for candy generally whole fruits are used. Prick by stainless pricker and dip in 4 per cent salt solution for 24 hours. Take one seer sugar for one seer slices. Make syrup in two seers of water. Boil slices in syrup for 10 minutes. Keep slices in syrup for overnight. On next day, drain whole syrup and concentrate it by two or three boilings. Pour out syrup on slices and keep them overnight. Repeat this process day by day till syrup reaches the consistency of honey. Keep it for three days. After this period boil slices for 15 minutes in concentrated syrup. The preserve is now ready. For candy, consistency may be further increased by boiling slices for 10 minutes in concentrated syrup. Cover slices or whole fruits in dry sugar and pack in sterilised containers.

MANGO JELLY

Pectin is the main substance which forms jelly. Small fruits of 2-6 weeks growth are very rich in pectin, and excellent jelly can be prepared from them. After washing, peel fruits and cut them into pieces. Boil these pieces with 1½ times water for 30 minutes. Strain the juice through a thick cloth.

The recipe is as follow:

Mango juice	1 seer
Sugar	3/4 seer
Citric acid	1 gramme

(if juice is too acidic, no acid is added).

Add sugar and citric acid in juice and cook the whole product, the temperature rising upto 106°C. Cool down the product and fill it in sterilized bottles. The jelly will set within 24 hours.

MANGO PICKLE

There are so many recipes of pickles but the most common is given below:

Peeled slices of under-ripe mango	1 seer
Salt	3 *chanttauk*
Red chilli (powder)	1/2 ,,
Turmeric (*haldi*),	1/2 ,,
Aniseed (*sauf*),	1/2 ,,
Cloves	1/2 ,,
Fenugreek (*maithi*)	1 ,,
Mustard oil	4 ,,

Try all spices in a little oil. Mix slices in these spices. Add salt and keep them for two days in sun. Place the slices in another jar and drop oil in sufficient quantity to cover slices completely. Pickle will be ready within 15 days for consumption.

MANGO JAM

Grafted mangoes are best suited for jam. Select slightly ripened fruits and make slices after peeling. Slices are crushed to make a thick paste. Thick juice of seedling mangoes may also be used. The recipe is as follows:

Mango juice	1 seer
Sugar:	1 seer
Citric acid:	1/2 *tola*

Add sugar and citric acid in juice. Cook them till the temperature rises upto 106°C (222°F.). Cool the content and fill it in sterilized bottles.

MANGO SQUASH

Seedling mangoes are best for squash. Squeeze out the ripe fruits to extract the juice. The recipe is as follows:

Mango juice	1 seer
Sugar	1½ seer
Citrc acid	2 *tola*
Water	2 seers
Potassium metabisulphite (Preservative)	2½ *masha*

Make syrup of sugar and citric acid in water. Mix juice and strain it through a strainer. Add preservative after dissolving it in a small quantity of water. Fill the product in sterilized bottles and cork them. Seal bottles by dipping in hot melted wax.

MANGO LEATHER (AMABAT OR AMAPAD)

Wash well-ripened fruits of seedling mangoes. Extract the juice and strain it to remove fibres. Add two *masha* of potassium metabisulphite for each seer of juice. Now spread the juice in thin layers in trays smeared by vegetable edible oil. Place the trays in sun for drying. When first layer is dried up spread another on first one. Repeat this process till 1/8 to 1/4, thick layer is observed. Cut it in small pieces and wrap in plastic paper. Pack in dry containers.

DRIED MANGO SLICES (AMCHUR)

Wash firm unripe fruits with water, peel them with stainless steel knife and cut into small pieces discarding stone. To prevent browning, dip them in 2 per cent solution of common salt. After 15 minutes spread them in thin layers on trays. Place in strong sun and dry completely. Pack in dry containers.

"There's a word for service," *said Tata.*

"Impeccable...smooth...prompt."
suggested Fison.

"No, no," *said Tata.*

"Quiet...personal...careful," *offered Ralli.*

"Got it!" *said Tata, a gleam in his eye.*
"Integrated!"

Fison and Ralli agreed. Tata had a way with words.

Together they said, "We offer the farmer an integrated service. The finest range of fertilizers and pesticides in India. And what's more, we advise him on their use."

"A comprehensive service," *said Ralli.*

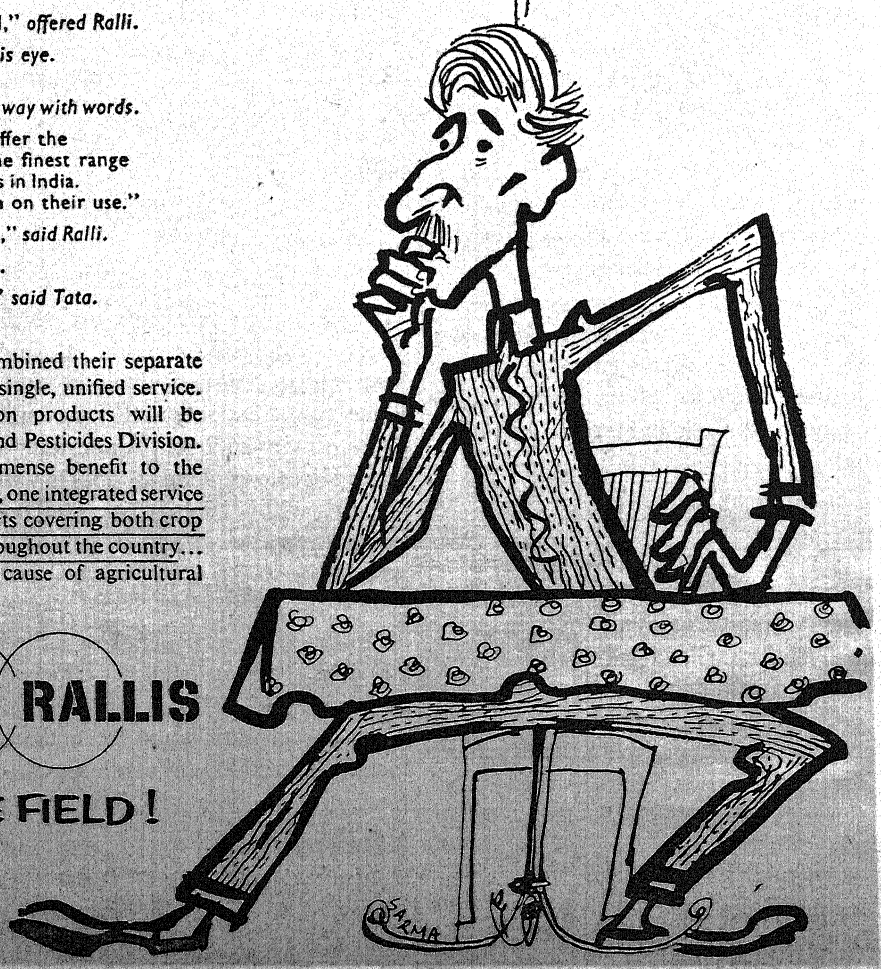
"A complete service," *said Fison.*

"An integrated service," *said Tata.*

Tata-Fison and Rallis have combined their separate marketing organisations into a single, unified service. For the future, all Tata-Fison products will be marketed by Rallis' Fertilizer and Pesticides Division. The merger will prove of immense benefit to the Indian farmer. For the first time, one integrated service will provide advice and products covering both crop growth and crop protection throughout the country... a notable contribution to the cause of agricultural progress.

TATA-FISON RALLIS

COVER THE FIELD!



TFRY-5

Horticultural Abstracts

abstracted by
P. C. Bose

I TROPICAL

480. THAPAR, A.R. AND J.P. PANWAR.

Studies on Side venear Grafting of Mango.

Himachal Horticulture, **4** (2.3) : 1-6, . April-Sept. 1963.

The summer months from April to June were found suitable for performing the operation. The results in the earlier part of this period tended to be somewhat better than in the latter.

The terminal and basal portion of current season's growth gave equally good percentage of bud take.

The stage of development of terminal and basal buds was an important factor in early and late sprouting. Terminal bud being well developed sprouted about a fortnight earlier than basal buds.

The use of basal buds, however, is also worth while to save the terminals for fruiting.

Among the varieties studied Langra gave a somewhat better response than Dasheri.

The determination of suitability and optimum period for veneer grafting of mango seedling has nearly solved the problem of propagation of mango plants.

Proper irrigation and manuring of nursery stocks and progeny trees in later winter helped in bringing them in a proper condition for grafting and getting good success.

481. BHAMBOTA, J.R., P.P. SINGH AND M.R. GUPTA

Studies of Salt Tolerance of Mango Plant.

Punjab Hort. Journal, **3** (2-4) : 169-170: April-Dec. 1963.

In order to study the salt tolerance of mango (Langra variety), three salts of sodium, viz., chloride, sulphate and carbonate were tried at various levels of concentration. The chloride increased the soil conductivity more than any other salt, whereas the carbonate had a more pronounced effect on the P^h value. The chloride caused the maximum leaf injury which might be attributed to both sodium and chloride ions. It was followed by sodium carbonate and sodium sulphate.

The P^h and conductivity of the soils of the submontane areas of the Punjab are consistent with the good growth of mango plants.

II. SUB-TROPICAL

482. HARMON, FRANK N. AND J.H. WEINBERGER

Bench Grafting Trials with Thompson Seedless Grape on various rootstocks.

Proc. Am. Soc. Hort. Sci., **83** : 379-383; 1963.

1. Bench grafting of grapes can be performed at any time during the dormant season with satisfactory results, but late-winter grafting was consistently more successful.

2. Pre-callusing of the grafts was not necessary when they were planted with the scions covered with soil.

3. Grafts made early in the winter can be kept dormant at 33-36°F in polyethylene bags until ready to plant.

4. Precallusing followed by waxing of the scion gave fairly good survival of certain rootstock grafts planted with scions exposed, and eliminated scion root development.

5. Use of saw type and knife type grafting machines was equally successful.

483. STREBKOVA, A.D.

Pomegranate varieties for the canning industry of Azerbaijan.

Konservnaya Ovoshchesushitel'naya Promyshlennost' **11** : 32-34; 1958.

The pomegranate is widely grown in Azerbaijan. For the production of natural juices, large-fruit varieties of pomegranate are the most suitable. The following varieties have been developed and are recommended for the canning industry. Gyulosha pink, krymzy Kabukh, Melles shelli, Bala Myursal, Kazyanskii red, Nazik Kabukh, veles red, Gyulosha azerbaidzhanskaya (the standard); the juice of these varieties contained from 10-17.5% of sugars and from 1.0 to 3.8% of citric acid.

484. KADMAN, A.

The uptake and Accumulation of chloride in Avocado Leaves and in Tolerance of Avocado Seedlings under saline conditions.

Proc. Am. Soc. Hort. Sci. **83** : 280-286; 1963.

Avocado seedlings of 8 varieties were grown under saline conditions produced by irrigation with water containing 500 ppm. cl as Nacl. The plants were graded for leaf scorches, growth was measured and leaf samples were taken for analysis every two months.

In general a close correlation was found between Cl content in the leaves and the grade of leaf scorch, except for the Maxican G1 7 variety. The seedlings of that variety showed the highest Cl content in their leaves and yet their damage rating was among the lowest.

The reliability of the various criteria used for valuation of salinity tolerance of avocado seedlings is discussed.

485. DAS, N.

Studies on the Action of NAA on the Flowering and Fruiting Pineapple.

Indian Jour. Agric. Sci., **34** (1) : 38-45; March 1964.

1. Pineapple plants, var. 'Smooth Cayenne' were applied with aquous solution of NAA at concentrations ranging from 50 ppm. to 200 ppm. by a single treatment. There were altogether eight treatments including one of untreated control laid out in a randomized block design.

2. The results of the experiments indicated a rising trend in flowering percentage following application of NAA. The flowering percentage rose upto 100 per cent as against 72.22 of the control. Chi-square test proved that the effect of NAA is highly significant. There is also early flowering by about seven days in NAA treated plants.

3. Period of fruit development from the time of flower differentiation to fruit ripening is prolonged by about 15 days as a result of treatment with NAA. Statistical analysis proves this delay in fruit ripening to be highly significant.

4. NAA application caused increase in fruit weight and dimension.

5. Total number of fruitlets per fruit and the size of the fruitlets are observed to have increased significantly. The increase in the size of fruits as induced by a auxin treatment may, therefore, be in consequence of rise in the number of fruitlets and the larger size of each fruitlet.

6. The size of the peduncle of the fruit is also found to increase as a result of NAA treatment.

486. LEWIS, L.N., C.D. McCARTY AND P.W. MOORE

Effects of skeletonization on the Rejuvenation and Production of Declinizing orange Trees.

Proc. Am. Soc. Hort. Sci. **83** : 295-299;1963.

Skeletonization (a severe type of pruning) Washington Navel and valencia orange trees in California has been shown to be of no commercial advantage. Size of the fruit was generally increased but not enough to offset the decrease in yield resulting from pruning. An extra polation of 1962 citrus prices showed that for all plots and all years, fruit from the check trees was worth over $6.00 per tree more than fruit from the skeletonized trees.

487. BRADFORD, G.R., R.B. HARDING AND T.M. RYAN

A comparison of the micro element composition of orange leaves from non fruiting and Fruiting Terminals.

Proc. Am. Soc. Hort. Sci., **83**: 291-294; 1963.

A comparison has been made between the micro element content of orange leaves of 4 to 6 months old taken from non-fruiting and fruiting terminals of the same trees, obtained from 22 representative orange orchards of California.

Significantly larger amounts of Cu were found in leaves from non-fruiting than from fruiting terminals. No significant diffierences were found in the amounts of Al, B, Ba, Fe, Mn, Pb, Sr. and Jn. The concentrations of Ag, Co, Cr, Ga, Li, Mo, Ni, Sn, Ti and V in the samples were in general less than the detectable limits of the spectro chemical method.

A reliable diagnosis of the Cu status of orange trees is dependent on analysis of leaves sampled by the same method as used in the development of standards.

488. COHEN MORTIMER AND HERMAN J. REITZ

Rootstocks for valancia oranges and Ruby Red Grapefruit—Results of a trial initiated at Fort Pierca in 1950 on two soil types.

Citrus Industry, **45**(3) : 12-16; March, 1964.

Rootstock trial plantings of valencia orange and Ruby Red grapefruit trees were set out in December 1950 at Fort Pierce on both Leon and Parkwood soils. Six major rootstocks are involved: Cleopatra mandarin, Rangpur lime, Rough lemon, Parson Brown sweet orange, sour orange and trifoliate orange.

Yield of fruit on the parkwood soil has been about twice as great as yield on Leon, on the average. Rough lemon has had the highest cumulative yield of all rootstocks in all 4 plots in boxes of fruits and in pounds of total solids except that, in the valencia plot on Leon soil, yield of trees on Rough lemon was equalled by those on Rangpur lime. Yield of valencia trees on cleopatra mandarin stock was very low during the first 10 years of the experiment but since 1961 has been comparable to yields obtained on sour orange and sweet orange stocks.

The weight of fruit in a full field box has been found to be remarkably uniform regardless of rootstock.

489. HEARN, C. JACK, W.C. COOPER, R.O. REGISTER & ROGER YOUNG

Influence of variety and rootstock upon freeze injury to the citrus trees in the 1962 Florida Freeze.

Citrus Industry, **45** (3) : 17-21; March, 1964.

A survey of citrus trees in Lake and Orange countries Florida was conducted at 4 intervals following the December 1962 freeze. Orlando tangelo and Hamlin orange were found to be the most cold tolerant varieties. In descending order these were followed by valencia orange, and grape fruit. The least tolerant were pineapple orange, temple orange and dancy tangerine.

The rootstocks had a striking effect on cold tolerance and cleopatra mandarin and sour orange rootstocks gave more tolerance than Rough lemon.

490. BHAMBOTA, J.R. AND D.K. UPPAL

Studies on fruit-set and Fruit-Fall in Sweet orange (*Citrus sinensis* **Osbeck**) **in the Punjab.**

Himachal Horticulture, **4** (2, 3) : 24-33; April-Sept., 1963.

Initial fruit set was higher in Mosambi (63% and 61.62%) than in Blood Red (54.12% and 55.87%) in both the years of 1960 and 1961. However the fruit retention was more in Blood Red (4.75%) than in Mosambi (4.12%) during the year 1960.

Eastern and western aspects of the tree appear to be more congenial for final retention than the Northern and Southern aspects.

The proportion of the tree crown set the maximum number of fruit initially and the lower the least ultimate retention in the middle portion was greater than in the other two portions.

Fruit set as well as its retention was more on the periphery of the tree in comparison with the inside of the tree.

491. FLEMING, JOE W.

Analysis of concord grape plant sap for Diagnosis of Nutrient status.

Proc. Am. Soc. Hort. Sci., **83**: 384-387; 1963.

Sap from the concord grape plant at the beginning of the groiwing season contains sufficient concentrations of Ca. Mg. K, P and N for analysis.

The concentration of N, K and P in the sap was increased by the applicatlon of these respective nutrients to the soil.

Significant correlations between the K or P content of the sap and the respective element content of leaves and petioles developing later in the season were found.

492. CAHOON, G.A., E.S. MORTON, B.W. LEE, AND G.E. GOODALL

The use of plastic Ground covers in citrus nurseries.

Pro. Am. Soc. Hort. Sci. **83**: 309-315; 1963.

Various types and thicknesses of pyethylene and vinyl plastic sheets were placed on the soil around the base of citrus seedlings and buddlings. Near the coast, using sweet orange rootstocks, significant growth increases were obtained from all plastic treatments (black-white, natural, black and aluminium polyethylene). Under similar climatic conditions a significant growth response was obtained from black and clear vinyl plastic using cleopatra mandarin as the rootstock. Further in land plastic applications produced significant treatment differences on sweet orange but not on troyer citrange or trifoliate orange. Black plastic controlled weed growth very effectively. Two plastics tested, natural and alluminium impregnated polyethylene, did not have sufficient durability or longevity for nursery use.

493. ZIDAN ZAKARIA

The relationship between time of flower opening and its ability to become a mature fruit, in three orange varieties.

Annals of Agricultural Science, **4** (2) : 45-52; Dec. 1959.

The relation between time of flower opening during the blooming period and its ability to grow into a mature fruit has been studied in two successive years with three orange varieties, Baladi, Succari and Valencia. It was observed that flowers that opened around the middle of the blooming period had the best chance to grow into mature fruits. Early and late opening flowers, on the other hand, had a rather poor chance in this respect. The fruiting percentage was very low at the beginning of the flowering season. It then increased steadily to reach its maximum during the early days of April which coincided with the middle of the season. It then decreased again till blooming ended. Temperature changes during the blooming season was found to follow the same trend.

III. TEMPERATE

494. CHADHA, T.R. AND A.R. THAPAR

Studies on the propagation of Persimmon.

Himachal Hort., **4** (2, 3) : 19-23; April-Sept., 1963.

Diospyros lotus has been found to be a suitable rootstock for commercial varieties of persimmon.

The optimum depth of sowing the seed was one inch. The seed sown at different times during the winter and spring seasons gave equally good germination.

The percentage take of grafts by collar grafting in different scion varieties ranged from 71.36 to 81.05.

The technique of collar or crown grafting in these studies which gave a high percentage of take of grafts has been found to be useful and merits commercial application.

495. ROMANI, R.J., F.C. JACOB, F.G. MITCHELL AND C.M. SPROCK

Light Transmittance characteristics of Maturing Apricots.

Proc. Am. Soc. Hort. Sci. **83**: 226-233; 1963.

The light transmission characteristics of whole apricots have been determined. Within the limits of present instrumentation, spectral changes are discerned in the 550 to 680 mm range corresponding to changes in the carotenoid and chlorophyll pigments. A ratio of the light transmitted at 590 and 650 m u has indicated potential as a measure of apricot maturity.

496. RYUGO KAY

The apparent Reversibility of Pear Decline by Top Grafting to clones of Pyrus Seriotina (Rehd)'

Proc. Am. Soc. Hort. Sci. **83**: 199-204; 1963.

Bartlett and Buerre Hardy trees in varying stages of "slow decline" were top worked both above and below their unions with scions of Japanese pear varieties because these P. serotina clones are seemingly resistant to the pear decline disorder. Five of these trees have apparently recovered. Three trees having P. communis interestocks, whose lower graft unions showed a brown line condition at the time of grafting, now show no visible symptoms of this disease. The recovery of these trees is attributed to: (a) The elimination of much of the toxic principle in the vascular system with the removal of most or all of the P. Communis top; (b) the top was replaced by an oriental clone on which pear psylla prefer not to feed; and (c) the treatment was accomplished while the cambium retained its capacity to regenerate normal replacement phloem.

497. LEWIS, LOWELL N., N.E. TOLBERT AND A.L. KENWORTHY

Influence of Mineral Nutrition on the Amino Acid Composition of Bartlett Pear Trees.

Proc. Am. Soc. Hort. Sci., **83**: 185-192; 1963.

Bartlett pear trees grown in nutrient solution cultures showed some marked changes in the amino acid concentrations in their mature leaves and growing shoots. The free amino acid concentration was much greater in young shoots than in mature leaves.

Low levels of K caused the greatest change in total amino acids in the mature leaves, most of which was due to an accumulation of as paragine and glutamine.

Low levels of N and Mg resulted in the lowest concentrations of total amino acids in young shoots. The failure of this tissue to accumulate as paragine was the main reason for this change.

The highest levels of total amino acids appeared in plants given an excess of N, P or K and seemed to be due to a general increase of several amino acids.

498. MICHELSON, L.F. AND W.J. LORD.

Moisture Extraction Pattern of McIntosh Apple Trees.

Proc. Am. Soc. Hort. Sci. **83**: 46-54; 1963.

Investigations were conducted during 1960 through 1962 to determine the moisture extraction pattern of McIntosh apple trees grown on a sod-mulch system of culture on typical Massachusette orchard soils.

The pattern of moisture extraction as determined by a concentric placement of plaster of Paris sensing units from the tree trunk to beyond the dripline indicated a moisture absorption gradient increasing toward the tree trunk.

The problem of obtaining soil moisture measurements representative of the potential moisture supply for the trees is discussed.

Implications as to the depth of rooting of apple trees on drumlin soils and the moisture supplying power of these soils were noted.

499. HEINICKE, DON R.

The Micro climate of Fruit Trees. II Foliage and Light Distribution Pattern in Apple Trees.

Proc. Am. Soc. Hort. Sci., **83** : 1-11; 1963.

Light and leaf area measurements were made in apple trees at predetermined grid locations. An integrated measure of the total light received during the day time was obtained by a method using uranyl oxalate actinometry. The method records a portion of the sky light as well as direct light. The light density in the tree was about equal on all sides. Light Density dropped rapidly with increasing depth of foliage. Light density was found to be related to the leaf area index.

500. FORSHEY, C.G.

The effect of Nitrogen status of McIntosh Apple Trees in Sand Culture on the Absorption of Magnesium from Epsom Salts sprays..

Proc. Am. Soc. Hort. Sci., **83**: 21-31; 1963.

Apple trees were grown in sand culture with 2 N and 3 Mg treatments in factorial combination. At the end of growing season the trees were separated into leaves, shoots trunk, bark, fibrous roots and large roots. Each fraction was dried weighed, and analysed for total N, Mg, K, Ca and P.

Absorption of Mg from both Epsom salts sprays and soil applications was satisfactory in trees receiving the higher rate of N. but not in the low N trees. The increase in absorption of Mg associated with the higher rate of N were more than could be attributed to differences in growth. Absorption of K and Ca was similarly effected.

The distribution of Mg was markedly affected by N level. A great part of the total Mg wass found in the leaves and a lesser part in the permanent tissues of the high N trees than of the low N trees. This was also true of all other elements determined.

IV. FLORICULTURE

501. SEMENIUK, P., R.N. STEWART AND J. UHRING

Induced secondary Dormancy of Rose Embryos.

Proc. Am. Soc. Hort. Sci. **83**: 825-828: 1963.

Freshly harvested seed of Rosa setigera Michx. 'Serena' require after ripening and do not germinate when kept moist for 90 or more days at 65° F. Embryos dissected from seed kept moist at 65° for 90 days after harvest would not grow. The secondary dormancy of such embryos was broken by after ripening in intact seed at 40° for 90 days. The secondary dormancy of such embryos was not broken by after ripening the dissected embryo on agar at 40° for 90 days.

502. COORTS, GERALD D. AND J.B. GARTNER.

The effect of various solutions on keeping quality of better times rose with and without "Hooks".

Proc. Am. Soc. Hort. Sci., **83**: 833-838; 1963.

The use of a commercial preservative significantly increased the keeping quality, the amount of solution absorbed, and the stem weight of better times roses over that of either tap or deionized water, regardless of whether or not hooks were present. When hooks were present, there was no significant difference in keeping quality, stem weight, or water absorption with either tap or deionized water. Tap water was better than deionized water for increasing keeping quality, water absorption, and stem weight, if hooks were removed from the rose stem. Removal of hooks was advantageous when stems were held in tap water.

503. JAIN, S.K.

A note on Propagation of Sand binding creeper ipomoea pescaprae.

Allahabad Farmer, **37** (6): 9-10; Nov., 1963.

An experiment was done to observe the growth of the plant from different kinds of vegetative cuttings at Allahabad. Since the plant naturally grows in sandy habitats trials were first done in beds filled purely with sand. No manure was provided. Cuttings were put in sand beds in the month of August (1960).

Only the node-bearing stem cuttings sprouted and grew into long creeping plants. None of the other cuttings sprouted till November when the experiment was closed.

A similar experiment was laid out in ordinary garden soil (in Sept. 1960). 9 out of 10 non-bearing cuttings sprouted and established themselves. In the month of February, i.e., cold and dry season, only cuttings bearing adventitious roots on nodes established.

Ipomoea pescaprae may be found suitable for sowing on sandy or rocky soils in drier regions as well as on water banks. It can be used for hedges in gardens and bungalows. The twiner can be trained on railings or bamboo structures for screening or ornamental purposes. The fleshy, thick and glabrous leaves form hand sane dense masses. Rose-purple flowers show a beautiful contrast on the back ground of green foliage.

V. MISCELLANEOUS

504. RICHARDSON, H.L.

The fertility potentialities and needs of tropical soils.

Trop. Sci. **5** (3): 166-178; 1963.

The paper stressed the need for considerably more investigation of suitable nutrition

of crops grown on tropical soils. In general the main needs are for three primary nutrients; nitrogen, phosphate and potash.

The author states that it is estimated that the combination of fertilizers and other improved methods could lead to a wide spread doubling of yields within a generation, with further increases to follow. At present, the consumption of fertilizers in the tropics is about two million tons a year compared with 26 million tons in the temperate zones.

505. DANA, MALCOLM N., H.L. LANTZ AND W.E. LOOMIS.

Studies on translocation across Dwarf Interstocks.

Pro. Am. Soc. Hort. Sci. **82**: 16-24; June 1963.

Apple trees of own stem, dwarf interstock and dwarf interstock bridged stem combinations were used to test the hypothesis that interstocks of dwarf clones impede translocation of nitrogen. Evidence is presented to show that the own-stem trees which were at a lower N level at the start of the test accumulated leaf N more rapidly than dwarf interstock trees.

Graft unions alone do not offer an explanation of stock effect, as self interstock trees accumulated N more rapidly than dwarf interstock trees.

Leaf analyses of field grown trees showed that own-stem, dwarf and bridged trees differed significantly in reducing sugar content but not in total N and reserve polysaccharide.

Some evidence is presented to show that water movement in apple trees is not impeded by the presence of an interstock of Clark Dwarf.

506. EKANAYAKE, D.T.

Planting wind breaks in Ceylon.

Tropical Agriculturist, **118** (1): 15-22; Jan.-March 1962.

A detailed description of the effect of wind on vegetation, purpose of wind breaks, disadvantages of wind breaks, qualities of trees for wind breaks, planting wind breaks, and a list of suitable trees for wind breaks is given.

507. HEINICKE, DON R.

The Micro-climate of Fruit trees.

Canadian Journal of Plant Science, **43** (4): 561-68; Oct. 1963.

A light meter using uranyl oxalate actinometry has been developed for use in studies of tree micro-climate. The method is based on photo destruction of oxalic acid in the presence of uranyl sulphate. The total amount of oxalic acid destroyed is determined by titration with deci-normal potassium permanganate. A linear relationship between the actinometer readings and gm. cal. day^{-1} $cm.^{-2}$, as recorded by an Eppley pyrheliometer, was shown on bright days. A similar relationship was shown with time of exposure at a fixed light intensity. In micro-climate studies many readings of integrated light values can be taken with this inexpensive light measuring device.

508. GUTTRIDGE, C.G. AND D.T. MASON

The growth and cropping of cold stored strawberry runners in Scotland

Hort. Res. **3**(1): 34-44; Nov. 1963.

Delay in the planting of cold-stored runners from April to September, and of new-season runner from July to September, reduced yields in the following year.

New season runners out yielded cold-stored runners when both were planted at the same time. This attributes to the fact that chilling causes stored plants first to produce vigorous vegetative growth. Probably not until this phase is passed do they initiate trusses and build up food reserves for the following year's crop.

IPOMEAS

CONTD. FROM PAGE 21

and way along the margin. Flowers borne in clusters have short pedicels. The stigma is bilobed and maroon in colour. The five long yellowish-coloured filaments rising straight from the base around yellowish style have vertical anthers at the tip having plenty of white pollen almost reaching upto the stigma. The fruit bears a single brown round seed of the size of a small pea.

The leaves are light green, big, cardate, somewhat hairy with long and wiry peteoles which tend to bend down and turn leaf blades upside down. A few leaves may be removed here and there to expose the view and to reduce the vegetative portion. It sheds its leaves in winter and gives out fresh shoots in the month of May and June. A hardy plant which can stand extreme cold and heat, Ipomea thrives in the open sun and it can be easily propagated by cuttings. It is recommended for arches, pergolas, trellises and even a plant house over which it can spread in the very first year of planting. Cultivation of the plant is easy and it does not require any particular care. It is commonly affected by mealy bugs which can be controlled by spraying Folidol or any other insecticide.

This creeper has attracted the attention of plant lovers all over the country and hundreds of plants have been distributed to the growers in and outside the state. Many plants have been sent to Delhi where it is reported to grow well and therefore should find an increasing favour in home gardens.

IPOMEA VAR. "FLYING SAUCER"

This is one of the latest additions to the wealth of annual Ipomeas of our gardens. It is a new hybrid developed from the ever popular Heavenly Blue (Ipomea tricolour), in America in the year 1960. Introduced into India in 1961, and Lalbagh Gardens in 1962), it has since become a favourite to many a nurseryman and amateur gardeners.

The flowers are 4" in diameter at the expanded portion, with bright blue stripes. The throat with its white and yellow contrasting colours accentuates the flower's beauty. The stripes of blue and white create an illusion of whirling motion from which it derives its name "Flying Saucer". It comes to bloom in about 90-95 days in Bangalore conditions.

It can be grown well over the dome-shaped wiremesh or bamboo splits in the pots when the massed flowers look extremely beautiful. It also makes a good annual for the the window box and can be trained over the grills with beautiful effect. It is easily propagated by seeds which are black.

Thatch palm at the Botanical Garden, Culcutta →

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Botanical name	Common, trade or local name	Location			Type of forest if occurring in one, or nature of occurrence	Measurements		Estimated age	Present condition or other remarks
		Place	District or Forest Division	State		Girth in inches at breast height	Total height in feet		
1	2	3	4	5	6	7	8	9	10
1. *Abies densa*	Silver fir	Saburcum	Darjeeling	West Bengal	High level coniferous forest	108	100	Not known	Living, condition fair
2. *Acer campbellii*	*Kapasi*	North Rimbick	do.	do.	do.	156	90	do.	do.
3. *Adina cordifolia*	—	Dhikala 22	—	Uttar Pradesh	*Tarai* and *Bhabar*	308	125	—	Living
4. do.	—	Dulagarh 1, 4	Haldwani	do.	do.	287	117	—	do.
5. do.	—	—	Kalagarh	do.	do.	272	108	—	do.
6. do.	*Haldu*	Near Waghai on Waghai Nasik Road	Dangs Division	Bombay	Moist deciduous teak forest	218	145	—	Good
7. do.	do.	Comptt. No. 76A Allapalli	South Chanda	do.	Tropical moist deciduous	208	112	—	Healthy
8. do.	do.	Sika Village	—	Bihar	Dry deciduous forest	192	70	100 years	Partially defective
9. do.	do.	Virnoti	North Kanara	Bombay	Moist deciduous teak forest	146	131	—	Good
10. do.	do.	C/II P.B. Int. Lanoi Range	Bilaspur	Madhya Pradesh	Tropical moist deciduous	116	—	—	Healthy
11. do.	do.	Khamdih K.R.F. P.S. Panki	—	Bihar	Dry deciduous forest	108	85	140 years	Living
12. *Ailanthus excelsa*	Ailanthus	Khamgaon	Poona Division	Bombay	Riverain forests predominantly of *babul*	112	83	—	Good
13. *Betula alnoides*	Sour (Birch)	Raman	Darjeeling	West Bengal	High level coniferous forest	108	85	Not known	Living, condition fair
14. *Bucklandia populnea*	*Pipli*	North Rimbick	do.	do.	Upper hill forest	192	100	do.	do.
15. *Calophyllum tomentosum*	*Poon*	Mattingaddi in Honawar Range	Kanara West Division	Bombay	West Coast tropical evergreen	153	110	—	Good
16. do.	do.	do.	do.	do.	do.	152	120	—	do.
17. do.	do.	do.	do.	do.	do.	147	110	—	do.
18. *Castanopsis hystrix*	*Jat katus*	North Rimbick	Darjeeling	West Bengal	Upper hill forest	152	85	Not known	Living, but hollow

THE GIANT TREES OF INDIA—(*Contd.*)

1	2	3	4	5	6	7	8	9	10
19. *Cedrus deodara*	Deodar	—	Kulu Forest Division	Punjab	Demarcated protected forests	648	89	do.	Fair
20. do.	do.	Near old F.R.H. Nandan Banihal Range	Ramban Forest Division	Jammu	Poor quality deodar forest	456	—	Over 1,000-1,200 years	—
21. do.	do.	33 Kuntwara	Thakrai Doda Division	do.	Deodar forest	406	150	500 years	—
22. do.	do.	At Wan	Garhwal Division	Uttar Pradesh	Western temperate	360	165	—	Living
23. do.	do.	Ola 3b	Tons Division	do.	do.	318	213	—	do.
24. do.	do.	3 Keshwan	Thakrai Doda Division	Jammu	Deodar forest	306	150	300 years	Heavily branched
25. do.	do.	Kistwar 6	Kistwar Division	do.	do.	268	197	—	—
26. do.	do.	Balcha 4b	Tons Division	Uttar Pradesh	Western temperate	303	183	—	Living
27. do.	do.	—	Seraj Forest Division	Punjab	Demarcated protected forest	181	180	Not known	Good
28. do.	do.	Mundalii	Chakrauta Division	Uttar Pradesh	Western temperate	166	200	—	Living
29. *Chickrasia tabularis*	*Chickrassi*	In Compt. 10BI. X in Guard Range	Kanara North Division	Bombay	West Coast tropical evergreen higher elevation type on laterite soils	111	76	—	Good
30. *Cupressus torulosa*	Cypress	Preservation plot No. 8	Garhwal Division	Uttar Pradesh	Western temperate	242	223	—	Living
31. *Diospyros melanoxylon*	*Tunki*	Maddipenta Rest House compound	Kurnool East Division	Andhra Pradesh	Occurs in a Rest House compound, in the vicinity is a mixed deciduous forest	106	Not known	Not known	do.
32. *D. griffithii*	*Gurjan*	South Andaman Jirkatang Coupe XI	—	Andaman Islands	Tropical evergreen	216	142	Not known	—
33. *D. incanus*	do.	South Andaman (Kandantala)	—	do.	do.	264	Not known	do.	—
34. *D. turbinatus*	do.	Andaman Park Coupe IV(S)	—	do.	do.	285	144	90 years	Sound
35. *Dipterocarpus turbinatus*	do.	Near Dhumas mile stone 243/7 in Honawar Range	Kanara West Division	Bombay	West Coast tropical evergreen	273	120	—	Good
36. *D. turbinatus*	do.	Andaman Park Coupe III A	—	Andaman Islands	Tropical evergreen	212	155	90 years	Sound

THE GIANT TREES OF INDIA—*(Contd.)*

1	2	3	4	5	6	7	8	9	10
37. *Dipterocarpus turbinatus*	do.	Andaman Park Coupe OV(S)	—	do.	do.	206	143	85 years	do.
38. do.	do.	Near Dhumas mile stone 243/7 in Honawar Range	Kanara West Division	Bombay	West Coast tropical evergreen	183	120	—	Good
39. do.	do.	do.	do.	do.	do.	141	110	—	do.
40. do.	do.	do.	do.	do.	do.	132	120	—	—
41. *Eriodendran anfractuosum*	*Safed semal Hattian* Hindi. *Shameula* Mar.	Near Golconda Fort	Hyderabad	Andhra Pradesh	—	946	72	Not known	Living
42. *Eucalyptus globulus*	Eucalyptus	Municipal Park Kodaikanal Town	Madurai district	Madras	Temperate evergreen plantations	378	120	About 100 years	Living, sound, has buttresses
43. do.	do.	Aramby Reserved Forests	Nilgiris	do.	do.	213	210	93 years	Healthy growth (Tree No. 53)
44. *Ficus bengalensis*	Ficus	Gootibylu village	Danayanicherovu Firka, Kadiri Taluk, Anantpur Division	Andhra Pradesh	Isolated tree in Field Survey No. 60 of the village	The tree spreads over nearly 3.50 acres		About 200 years	Living
45. do.	Ficus	*In Mal* area Nistar Bilpan opposite to Naka Balpan	Bhopal	Madhya Pradesh	—	668 660	About 75	About 300 years	Good, forked. Girth measurements given separately for each branch
46. do.	*Bargat, burh, bare*	Dagunia village	Kolhan Division	Bihar	Dry deciduous forest	300	60	120 years	Living normal
47. do.	do.	Karkatia village	do.	do.	do.	264	60	120 years	do.
48. do.	do.	Ganmore village	do.	do.	do.	240	50	120 years	do.
49. *Ficus glomerate*	Fig	Kaynanuka	Darjeeling	West Bengal	Sal with mixed species	345	123	100 years	Sound, forked at nine feet and buttressed
50. *Hardwickia binata*	*Anjan*	On south side of Umarti Satrasen Road between mile stone Nos. 27/3 & 27/4	—	Bombay	Dry teak	99	69	—	—
51. *Holoptelea integrifolia*	*Kanju*	Maswari	Haldwani Division	Uttar Pradesh	*Bhabar* forest	234	174	—	Living
52. do.	*Chirol*	Near Barwaha town	Indore	Madhya Pradesh	On Govt. wasteland	164	125	About 70 years	Good
53. *Hollock*	—	Katakhal reserve near Bariel Forest village	Cachar Division	Assam	—	126	60	—	Standing
54. *Juglans regia*	Walnut	Seri Dhar	Tons Division	Uttar Pradesh	Western hill forest	168	138	—	Living

THE GIANT TREES OF INDIA—(*Contd.*)

1	2	3	4	5	6	7	8	9	10
55. *Mangifera indica*	*Am*	English Bazar Malda	Malda	West Bengal	Not occurring in forest but in a field outside the town	270	60	More than 100 years	Living, condition fair
56. do.	do.	Leda 3	—	Bihar	Valley type	228	110	100 years	Living, normal
57. do.	do.	Leda 26	—	do.	do.	222	50	120 years	do.
58. do.	do.	Leda 15	—	do.	do.	216	90	110 years	do.
59. do.	do.	Leda 13	—	do.	do.	212	90	108 years	do.
60. *Michelia champaca*	*Champa*	Kakrachera in Atharemura Khowai Range	—	Tripura	Mixed moist misc. forest	264	50	120 years	Top broken (dying)
61. *Michelia excelsa*	*Champ*	North Rimbick	Darjeeling	West Bengal	Upper hill forest	156	90	Not known	Living, but hollow
62. *Picea smithiana*	Spruce	Rikhnar	Chakrata Division	Uttar Pradesh	Western temperate	270	172	—	Living
63. *Pinus roxburghii*	*Chir*	Chiranga	Garhwal Division	Uttar Pradesh	Western temperate	104	191	—	Living
64. *Platanus orientalis*	*Chinar*	Bijbehara along the Jhelum river 25 miles from Srinagar	Srinagar	Kashmir	—	492	—	—	Branchy, gnarled and hollow
65. *Pterocarpus dalbergioides*	*Padauk*	Coupe IV	North Andaman	Andaman Islands	Tropical moist deciduous forest	237	151	100 years	Sound
66. *P. dalbergioides*	do.	do.	do.	do.	do.	216	160	100 years	do.
67. *Pterocarpus marsupium*	*Bija*	Dhaba Range	South Chanda	Bombay	do.	130	116	—	Healthy
68. do.	*Bija sal*	Village Lawabar P.S. Panki	Distt. Palamau	Bihar	Dry deciduous forest	120	77	120 years	Living
69. *Querous floribunda*	Oak	Mundali	Chakrata Division	Uttar Pradesh	Western temperate	135	135	—	do.
70. *Querous lamellosa*	do.	Sandakphu	Darjeeling	West Bengal	High level coniferous forest	210	75	Not known	Living, condition fair
71. *Querous lineata*	do.	Jorepokhri	do.	do.	Middle hill forest	246	75	300 years	Overmature, top half portion dead
72. do.	do.	Sandakphu	do.	do.	High level coniferous forest	168	90	Not known	Living, condition fair
73. *Querous pachyphylle*	do.	do.	do.	do.	Upper hill forest	258	80	do.	Living, but hollow
74. *Salmalia malabarica*	*Semal*	—	Tarai and Bhabar Division	Uttar Pradesh	—	361	140	—	Living
75. do.	do.	Patung village	Kolhan Division	Bihar	Valley type	264	80	45 years	Living, normal

TEN GIANT TREES OF INDIA—(*Contd.*)

1	2	3	4	5	6	7	8	9	10
76. *Salmalia malabarica*	*Semal*	Khallari Rest House, Risgaon	South Raipur	Madhya Pradesh	Tropical moist deciduous	219	108	—	Healthy
77. do.	do.	Roaki village	Kolhan Division	Bihar	Valley type	204	80	120 years	Living, normal
78. do.	do.	Barkala village	do.	do.	do.	180	60	100 years	do.
79. *Schleichera elecsa*	*Kusum*	Preservation Plot No. 2 Allapalli	South Chanda	Bombay	Tropical moist deciduous	147	106	—	Healthy
80. *Shorea robusta*	*Sal*	Khikala	Kalagarh	Uttar Pradesh	Moist tropical	255	152	—	Living
81. do.	do.	Loharsi P.S. Panki	Distt. Palamau	Bihar	Dry deciduous forest	240	70	160 years	do.
82. do.	do.	Sukna	Darjeeling	W. Bengal	*Sal* with mixed species	196	148	150 ,,	Sound, forked at 22 feet
83. do.	do.	Kainsuajahira	Kolhan Division	Bihar	Valley type	195	80	120 ,,	Living, normal
84. do.	do.	Near Lamni Forest village	Bilaspur	Madhya Pradesh	Tropical moist deciduous	191	155	—	Healthy
85. do.	do.	Rairain village	Kolhan Division	Bihar	Valley type	188	112	120 years	Living, normal
86. do.	do.	Kara village	do.	do.	do.	186	90	120 ,,	do.
87. do.	do.	Gidam range	South Bastar	Madhya Pradesh	Tropical moist deciduous	180	—	—	Healthy
88. do.	do.	Kainsuajahira	Kolhan Division	Bihar	Valley type	180	110	120 years	Living, normal
89. do.	do.	Rajabasa village	do.	do.	do.	171	—	300 ,,	do.
90. do.	do.	Posoita	do.	do.	do.	165	90	115 ,,	do.
91. do.	do.	Soda village	do.	do.	do.	165	102	120 ,,	do.
92. do.	do.	Karkatia village	do.	do.	do.	156	110	110 ,,	do.
93. do.	do.	Rairain village	do.	do.	do.	156	90	115 ,,	do.
94. do.	do.	Range Compound Goilkera	do.	do.	do.	156	50	115 ,,	do.
95. do.	do.	Kara village	do.	do.	do.	156	85	120 ,,	do.
96. do.	do.	Salai village	do.	do.	do.	151	100	120 ,,	do.
97. do.	do.	Baraijahira	do.	do.	do.	148	95	109 ,,	do.
98. do.	do.	Range Compound Goilkera	do.	do.	do.	146	120	110 ,,	do.

TEN GIANT TREES OF INDIA—(*Contd.*)

1	2	3	4	5	6	7	8	9	10
99. *Shorea robusta*	*Sal*	Jambira village	Kolhan Division	Bihar	Valley type	144	110	110 ,,	Living, normal
100. do.	do.	Baraijahira	do.	do.	do.	141	85	112 ,,	do.
101. do.	do.	Patung	do.	do.	do.	138	80	110 ,,	do.
102. do.	do.	Samta 21	Saranda	do.	Valley type moist deciduous	133	135	Not determined	do.
103. do.	do.	Karampada 12	do.	do.	do.	131	117	150 years	do.
104. do.	do.	Samta 28	do.	do.	do.	130	125	Not determined	do.
105. do.	do.	Kodalibad 10	do.	do.	do.	126	105	145 years	do.
106. do.	do.	Karampada 12	do.	do.	do.	116	113	135 years	Living
107. do.	do.	Samta 21	do.	do.	do.	107	146	Not determined	do.
108. do.	do.	Sunamanthapala	Haldwani Division	Uttar Pradesh	Moist tropical	104	168	—	Living
109. do.	do.	Samta 28	Saranda	Bihar	do.	103	135	Not determined	do.
110. do.	do.	do.	do.	do.	do.	102	123	do.	do.
111. *Swietenia mahagoni*	Mahogani	Hyderabad city-Rangmahal gardens of Hyderabad Residency	—	Andhra Pradesh	—	298	107	Not known	do.
112. do.	do.	Arambagh Compound	—	West Bengal	Not occurring in forest	166	80	More than 200 years	Living, in good and healthy condition
113. do.	do.	do.	—	do.	do.	152	80	do.	do.
114. *Tamarindus indica*	*Imli*	Rumkut	Kolhan Divisional	Bihar	Dry deciduous forest	264	50	120 years	Living, normal
115. do.	do.	Pachkund Nursery	Ajmer	Rajasthan	Solitary in Pachkund Nursery	184	99	400 ,,	Satisfactory
116. do.	do.	Katra Revenue village	Bhopal	Madhya Pradesh	—	168	45	About 130 years	Very crooked
117. *Tectona grandis*	Teak	In Compt. 10 BI.X Guard Range	Kanara North	Bombay	Moist deciduous to semi-evergreen tract	237	85	—	Hollow
118. do.	do.	Compartment No. 27 Tunacadou Range	Coimbatore district	Madras	Mixed deciduous forest of good quality	233	95	Not known	Healthy growth

1	2	3	4	5	6	7	8	9	10
119. *Tectona grandis*	Teak (*Sagon*)	Compt. No. 76A Allapalli	South Chanda	Bombay	Tropical moist deciduous	204	114	—	Healthy
120. do.	Teak	Gund Range	Kanara North	do.	Moist deciduous	164	80	—	Hollow
121. do.	Teak (*Sagon*)	Compt. No. 76A Allapalli	South Chanda	do.	Tropical moist deciduous	156	141	—	Healthy
122. do.	Teak	Pliryan Forest Survey No. 67 by the side of Kilmata-Karwar Road	Kanara West	do.	Moist deciduous teak forest	153	82	—	Hollow
123. do.	Teak (*Sagon*)	Kutru Range	South Bastar	Madhya Pradesh	Tropical moist deciduous	138	—	—	do.
124. *Terminalia arjuna*	*Arjun*	Near Ram Kula village on the bank of Choral river	Indore	do.	Moist deciduous forest reserve	432	100	About 80 years	Good
125. *Terminalia belerica*	*Harra*	Sitanadi Rest House	South Raipur	do.	Tropical moist deciduous	160	106	—	—
126. *Terminalia myriocarpa*	Hollock	Khatakal R.F.	Cachar	Assam	Moist evergreen	126	60	—	Living
127. *Terminalia procera*	*Badam*	Andaman Park Coupe IV (S)	—	Andaman Islands	Tropical moist deciduous	214	125	80 years	Sound
128. *Terminalia tementosa*	*Saja*	Along Chirhatta nala (Compt. No. 344) Lamni Range	Bilaspur Division	Madhya Pradesh	do.	221	142	—	—
129. do.	*Sain*	Musabnagar	Ramnagar	Uttar Pradesh	Moist tropical	196	160	—	Living
130. do.	*Asan*	Borai Jahira	Kolhan	Bihar	Dry deciduous forest	172	90	110 years	Living, normal
131. do.	*Saja*	Along Chirhatta nala (Compt. No. 344) Lamni Range	Bilaspur Division	Madhya Pradesh	Tropical moist deciduous	160	131	—	—
132. do.	*Asan*	Rairain village	Kolhan	Bihar	Dry deciduous forest	144	95	90 years	Living, normal
133. *Ulmas wallichiana*	*Bran*	Ziarat	Kangam	Kashmir	Outside forest	394	—	250 to 300 years	Forked, hollow
134. do.	do.	Zowra village	Srinagar	do.	do.	509	—	—	do.

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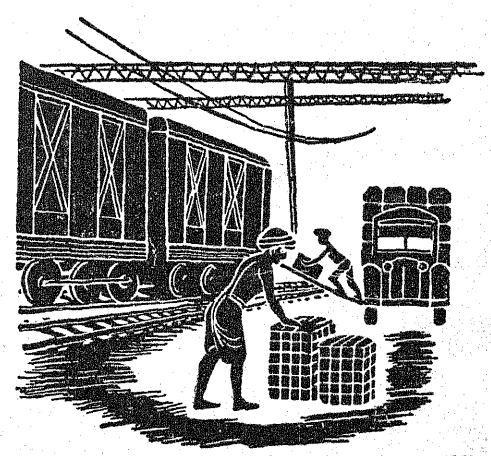

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